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JOURNAL

of the CANADIAN DENTAL ASSOCIATION / de L'ASSOCIATION DENTAIRE CANADIENNE

Vol. 61 No. 7

JULY
JUILLET

1995

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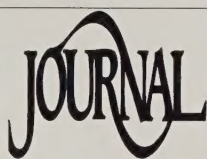
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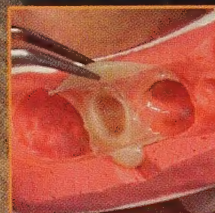
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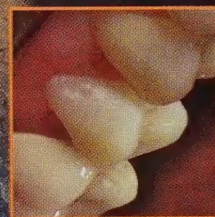
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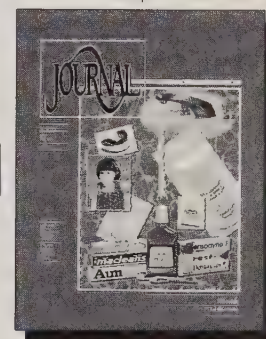


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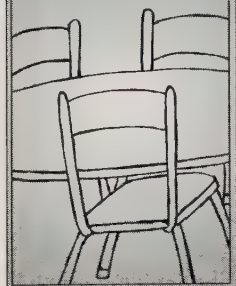
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(Photography by Greg Teckles;
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MEETINGS & COURSES



INTERNATIONAL



August 23-26

XV World Congress — International Congress of Oral Implants to be held in San Francisco, Calif. For more information contact: R. Craig Johnson, 248 Lorraine Ave., Upper Montclair, N.J. 07043, U.S.A. Tel.: (201) 783-6300, or fax: (201) 783-1175.

August 26-27

Annual Meeting and Convocation of the International College of Dentists to be held at the Chateau Laurier in Ottawa, Ont. For information contact Dr. William Spence, Registrar; 12A Yonge Blvd, Suite 1, Toronto, Ont. M5M 3G5; Tel./Fax (416) 487-2928.

October 23-27

83rd FDI Annual World Dental Congress to be held in Hong Kong. For information contact: Laura Stephenson (613) 523-1770 ext. 246.

October 31 - November 4

Centenary Congress — 28th International Dental Meeting to be held in Buenos Aires, Argentina and sponsored by the Asociación Odontológica Argentina. For more information contact: Dr. Guillermo Pisarenko, president, Junin 959, (1113) Buenos Aires, Argentina. Tel.: (1) 961-6141, or fax: (1) 961-1110.

November 15-17

Annual Congress of the Swedish Dental Society to be held in Stockholm, Sweden. For more information contact: Charlotte Nackstad, Swedish Dental Society, Box 5843, S-102 48 Stockholm, Sweden. Tel.: (8) 666 15 00, or fax: (8) 662 58 42.

January 19-23, 1996

18th Asian Pacific Dental Congress & 50th Indian Dental Conference to be held in Bombay, India. For more information contact Dr. Ashok Dhoble, Organising Secretary, 18th A.P.P.D. & 50th I.D.C., 534 Bombay Mutual Terrace, 2nd Floor, Sandhurst Brige Opera House, Bombay 400 007 India. Tel.: 91-22-361 0248, or fax: 91-22-367 2627

CANADA



August 26-29

Canadian Dental Association 1995 Convention to be held at the Ottawa Congress Centre in Ottawa, Ont. Scientific sessions, exhibit hall, social events, special activities, spouse's program and children's program. For more information contact: Laura Stephenson, CDA Conventions, 1-800-267-6354.

August 28

RCDCA — Attention All RCDC/CFDS Personnel — 80th Anniversary "Meet and Greet," to be held at the Chateau Laurier Hotel at 5 p.m. For further information contact: Captain W.S. MacKenzie, (416) 488-9735, or fax (416) 932-1994.

September 8-9

The University of Western Ontario's faculty of dentistry presents The Mustang Dental Symposium. Two days of clinically relevant education — two simultaneous programs — more than 30 speakers, to be held at the Radisson Hotel in London, Ont. For further informa-

tion contact: Ms. Najet Hassan, Continuing Dental Education, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

September 13-17

31st Annual Meeting of the Canadian Academy of Endodontics to be held at the Westin Hotel, Ottawa, Ont. For information contact: Dr. William J. Kost (519) 672-4611, or Dr. George Citrone (613) 238-2463.

September 14-16

Canadian Association of Orthodontists — Annual Scientific Session to be held at the Chateau Laurier Hotel in Ottawa, Ont. For more information contact the Canadian Association of Orthodontists at (416) 491-3186, or fax (416) 491-1670.

September 14-16

Canadian Academy of Restorative Dentistry and Prosthodontics is holding its scientific session in Toronto, Ont. at the Four Seasons Hotel. For more information contact: Dr. Jeff Martin, 1995 Convention Registrar, 90 Eglinton Ave. W., Suite 111, Toronto, Ont. M4R 2E4, or call (416) 488-7914.

September 15-17

Canadian Academy of Pediatric Dentistry/Académie canadienne de dentisterie pédiatrique, Annual meeting/Congrès Annuel to be held at the Sheraton Centre, Montreal, Que. For more information please contact: Dr. L.-R. Charette, 3550 Côte-des-Neiges, Suite G-80, Montreal, Que. H3H 1V4. Tel.: (514) 931-1155.

October 11-14

6th Annual Conference of the Canadian Association for Suicide Prevention (CASP)/6^e Congrès annuel de l'Association canadienne pour la prévention du suicide (ACPS) to be held in Banff, Alta. The theme of this conference is Building Connections for Suicide Prevention. For more information contact the Canadian Association of Suicide Prevention, c/o Suicide Information & Education

Centre, 201-1615 10th Ave. S.W., Calgary, Alta. T3C 0J7. Tel.: (403) 245-3900, or fax: (403) 245-0299.

October 20

The University of Western Ontario's faculty of dentistry presents **Dental Materials Review and Update**. For information contact the UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

October 20

Southern Ontario Surgical Orthodontic Study Group Meeting to be held in Windsor, Ont. For details contact Dr. Jeff Berger (519) 258-2632, or fax: (519) 258-2637.

October 20-22

21st Century Ceramics Symposium to be held in Vancouver, B.C. For more information contact: Ms. Mary Thomas, Vancouver Seminar for Dentistry, 280-7580 River Rd., Richmond, B.C. V6X 1X6. Tel.: (604) 278-5426, or fax: (604) 278-6864.

October 26-27

Bridging Communities, Building Futures, 24th Annual Scientific and Educational Meeting of the Canadian Association of Gerontology to be held at the Hyatt Regency Hotel, Vancouver, B.C. For registration information please write to: Conference Secretariat, c/o Gerontology Research Centre, Simon Fraser University, 515 W. Hastings, Suite 2800, Vancouver, B.C. V3B 5K3. Tel.: (604) 291-5062, or fax: (604) 291-5066.

October 27-28

The University of Western Ontario's faculty of dentistry presents **Guiding the Developing Dentition**. Guest speaker: Dr. Jon T. Kapala. For information contact the UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

October 27-29

Workshop Meeting of the Canadian Association of Dental Consultants to be held in Toronto, Ont. For information contact: Dr. W. Nor-

gate, 901 St. Mary's Rd., Winnipeg, Man. R2M 3R4.

November 4

The University of Western Ontario's faculty of dentistry presents **Oral Pathology and Panoramic Radiology**. For information contact the UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

November 30 - December 2

The University of Western Ontario's faculty of dentistry presents **Crown and Bridge Back to Basics**. For information contact the UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

U.S.A.



September 15-16

The American Dental Association, Michigan Dental Association and West Michigan Dental Society are proud to celebrate during 1995 the 50th Anniversary of Community Water Fluoridation in the United States. An international symposium on community water fluoridation will be held at the Van Audel Center in Grand Rapids, Mich. For more information contact: Dr. Arnold Morawa or Ms. Debbie Montague, University of Michigan School of Dentistry, 1011 N. University Ave., Ann Arbor, Mich. 48109-1078. Tel.: (313) 764-6856, or fax: (313) 936-3065.

October 4-6

58th Annual Meeting of The American Association of Public Health Dentistry — Call for Abstracts. The AAPHD is inviting papers on a broad range of dental public health topics for presentation at its annual meeting. The theme of this year's meeting is "Oral Health: The Primary Care and Prevention Model." Deadline for submission is May 1, 1995. For further information con-

tact AAPHD National office, 10619 Jousting Lane, Richmond, Va. 23235-2828. Tel: (804) 272-8344, or fax: (804) 272-0802.

October 7-11

136th Annual Session of the American Dental Association to be held in Las Vegas, Nev. For more information contact the American Dental Association, 211 E. Chicago Ave., Chicago, Ill., 60611, U.S.A. Tel.: (312) 440-2658, or fax: (312) 440-2707.

November 27-28

American Board of Oral and Maxillofacial Radiology 1995 — Certifying Examination. Applications must be submitted by May 15, 1995. For further information please contact Dr. Curtis Lundeen, School of Dentistry — Oral Radiology, Oregon Health Sciences University, 611 S.W. Campus Dr., Portland, Ore. 97201-3097. Tel.: (503) 494-8930.

DENTAL MEETINGS



August 25-26

Annual Meeting of the CDA Board of Governors to be held in Ottawa, Ont. Contact: Suzanne Burton (613) 523-1770, ext. 201, or 1-800-267-6354.

August 26-29

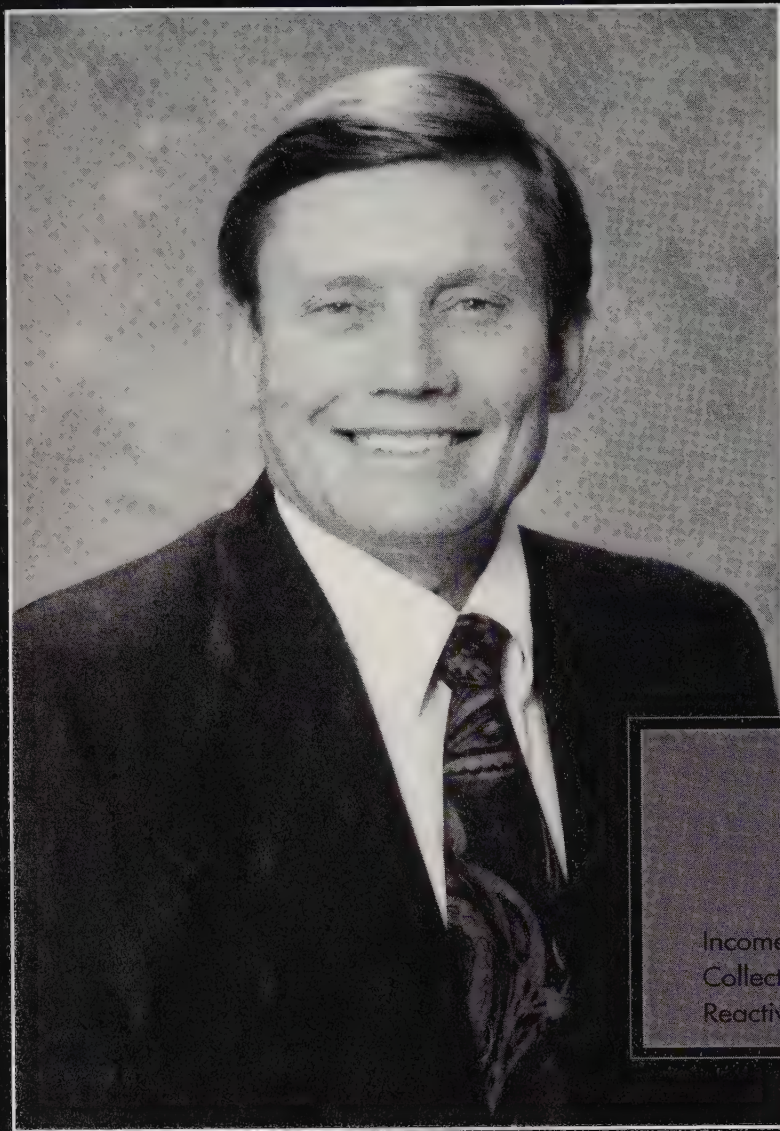
CDA 1995 Convention to be held in Ottawa, Ont. at the Ottawa Congress Centre. Contact: Laura Stephenson (613) 523-1770, ext. 246, or 1-800-267-6354.

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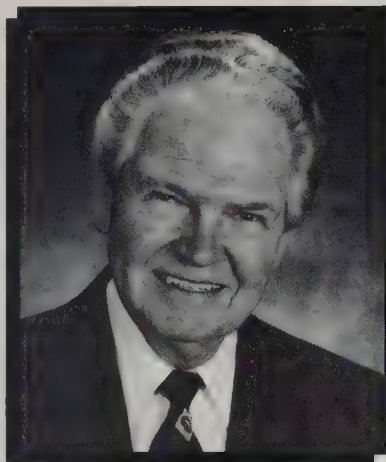
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EDITORIAL

THE CHALLENGES OF CHANGE



Dr. P. Ralph Crawford,
Editor

Last month, I was invited to address the delegates to the CDA dental student affairs committee on the changes taking place in dentistry today, and on how these changes could influence their future careers. As I developed my thoughts, and tried to look at the world through the eyes of a second-year dental student, I realized that the changes I see coming will not only affect dental students, but also the profession at large.

It's no secret that change is inevitable in society. As the Greek philosopher Heraclitus said so well more than 25 centuries ago: "Nothing is permanent but change."

Not that change is always a bad thing — it can be for the better. The message I tried to get across to the students was that while major changes are looming on the dental horizon, they should not be seen as harbingers of doom and gloom, but merely as challenges to be overcome. And ever since it evolved into a profession in its own right, dentistry has met and overcome one challenge after another.

The challenges we face in adapting to the technological advances sweeping through dentistry today, with computerization, are no more difficult than the challenges faced by the dental pioneers who preceded

us. This isn't the first time that dentists have faced the virtual reconstruction of their dental offices in the name of delivering better dentistry, nor will it be the last. We lived through it with the change from stand-up-gas-pump units to sit-down, four-handed, four-eyed, no-spit dentistry, and we survived it way back before the turn of the century, when we had to rebuild our offices to incorporate electricity and running water.

An excellent example of dental adaptation can also be seen in the changes that have occurred in infection control practices over the last seven years. For dentistry, the impetus for change was the tragic circumstances surrounding six Florida patients, and the contention that the HIV virus had been transmitted to them by their dentist, Dr. David Acer.

Almost overnight, we became more gloved, more masked, more gowned and more goggled than we ever had before in the history of clinical dentistry. Meeting the changes required by universal precautions required many dentists to adopt a whole new mode of practice. But dentistry met the challenge. To the dental student of today, infection control is routine.

What, then, are some of the challenges of change facing the dental profession today?

Certainly, any move by government to limit the use of amalgam restorations would be at the top of the list, as would changes in the current thinking about fluoridation. Both changes could virtually change dental practice.

When Dr. G.V. Black developed his near-perfect amalgam formulation in 1895, the use of amalgam restorations became widespread in dentistry. Today, however, in response to both scientific concern about amalgam and popular demand, dedicated dental research is rapidly developing alternatives, many of which are more esthetically pleasing than amalgam. We will meet this challenge of change, as we have met all others, with confidence.

Regardless of what happens in the future, overcoming the challenges of fluoridation 50 years ago

will always be remembered as a great victory in the history of preventive dentistry. No other single event has improved the oral health of Canadians as much as the addition of fluoride to drinking water and toothpaste. This victory would never have been realized if dentists and dedicated lay people had not seen the need for change, and if they hadn't been brave enough to stand up and challenge the "anti's" of the day.

We recognize that current fluoridation policies must be monitored, in light of the most recent scientific knowledge, and changed as required. Unfortunately, while science, and not public opinion or the media, must determine when change is needed, the anti-fluoridationists are still out there attacking at every opportunity. We must be ready for the challenge.

Few pressures for change are more evident today than those being exerted on third-party payment plans. CDA's "Enough is Enough" campaign resulted in a major victory for dentistry, but the fight to preserve dental plans and the oral health gains made by Canadians in the last 50 years is far from over.

The challenge is to develop payment plans that at one and the same time are fair, equitable, and deliver optimal dental health. Last month, CDA's national third-party dental conference in Toronto took the first step in this direction. Success will be achieved when a new, workable framework is achieved that meets the needs of all concerned parties, including dental patients, insurance companies, employers, and dentists.

Whether you are a second-year student or a veteran dentist, these impending changes and others will continue to challenge your future. Change is inevitable. As dentists, we must rise to the challenge on behalf of our patients and our profession. If we don't, we could suffer the fate described by Sir Francis Bacon over 400 years ago: "He that will not apply new remedies must expect new evils."

P. Ralph Crawford, BA, DMD
Editor of the *Journal of the*
Canadian Dental Association

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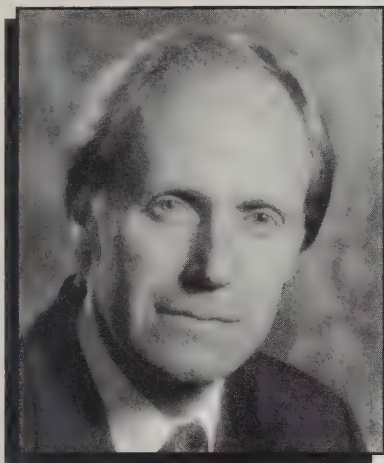
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Dr. Bryun Sigfstead,
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With all the excitement generated by the successful outcome of CDA's "Enough is Enough" campaign in 1995, and the FDI World Dental Congress in 1994, one of the association's most important accomplishments in recent years has been largely overlooked.

Nevertheless, there is no question that this achievement — meeting the financial objectives of our five-year plan — will have a greater impact on CDA's future viability than any other single activity that we've undertaken on behalf of Canadian dentistry.

You may recall that CDA's five-year fiscal plan was prepared in 1992, when the combination of a global economic recession and three extraordinary demands on our financial resources prompted us to take out a \$1.5-million first mortgage on our headquarters building.

Although none of CDA's leaders were eager to assume this debt, the mortgage represented the best answer to an unusual situation. In 1992, CDA's long-term success hinged on moving forward in three vital areas: the development of the CDAnet program; the settlement of all legal issues related to the use of surplus funds generated by the

CDIP Life Plan; and beginning the initial preparations for FDI 1994.

At the same time, however, it was clear that any success we enjoyed in these three areas would be meaningless if we were unable to pay off the mortgage in a reasonable amount of time, while continuing to meet CDA's ongoing and future obligations. The end result was the five-year plan, and a commitment by both staff and volunteers to put CDA's financial house in order.

The five-year plan set out four specific objectives for CDA:

1. To meet the monthly interest and principal payments on the mortgage, which amounted to approximately \$180,000 per year, using operating funds;
2. To realize annual operating surpluses that would allow CDA to take advantage of the mortgage's 10 per cent pay-down option, and make an additional \$150,000 annual payment on the mortgage principal;
3. To reassess CDA's debt load at the end of the five-year term of the mortgage, with a view toward paying down an additional sum at that time; and
4. To build a cash reserve equaling 50 per cent of CDA's annual operating expenses.

It worked.

In the first two years of the five-year plan, CDA paid down the mortgage to the full extent possible. In year three, we paid it off altogether, completely fulfilling the first three objectives of the plan, and making CDA virtually debt-free.

We also established healthy operating reserves, and are well on the way to meeting the fourth objective of the plan. It will take some doing, but we anticipate that our reserves will reach the desired level of \$3 million, or about 50 per cent of CDA's annual operating expenses, before the five-year plan comes to an end in April 1997.

The financial and program success enjoyed by CDA over the last three years speaks for itself. It also reflects well on CDA's staff and volunteers. Because of their hard work and dedication, CDA is not

only out of debt, the surplus funds' lawsuit has been settled once and for all, CDAnet is up and running, and FDI 1994 was a huge financial and scientific success.

Stop for a moment and think about what these accomplishments mean. CDAnet not only allowed dentists to transmit insurance claims electronically, it also maintained the profession's control over the data. With the settlement of all legal questions pertaining to the use of surplus funds in the CDIP (Canadian Dentists' Insurance Program) Life Plan, the stage was set for a new, open relationship to develop between CDA and the Quebec Dental Surgeons' Association. And last but definitely not least, the 1994 FDI World Dental Congress put Canadian dentistry and CDA in the world spotlight.

As mentioned, FDI 1994 was also a major financial success, and there is no doubt that it played a significant role in allowing CDA to achieve the objectives set out in the five-year plan. However, the key to CDA's many accomplishments over the past three years was really sound financial management, the constant scrutinizing of expenditures, and hard work.

The other factors in our success have been unity and flexibility. Despite the tough times and difficult issues facing dentistry today, the profession has stuck together, united behind a common cause and a common mission. Yet we have remained open to change, and we've recognized that it is sometimes necessary to adapt our goals and objectives to meet changing circumstances. Through it all, we've known that by using our mission statement as our guide, and constantly reexamining ourselves and where we're going, we will be prepared for the future, and we will continue to do our best to meet the needs of our members, our profession, and the public we serve.

*Bryun Sigfstead, DDS
President of the Canadian Dental Association*

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NEWS UPDATE

CDA Issues New Statement On Amalgam

In response to a soon-to-be-released federal report on mercury, CDA has revised its statement on dental amalgam.

The revised statement was sent to all CDA members in late June as part of an information package that included a letter from CDA president Dr. Bryun Sigfstead and a series of questions and answers on dental amalgam.

Approved by CDA's executive council June 9, the questions and answers are designed to help dentists communicate more effectively with their patients on the amalgam issue.

"CDA has learned that more questions may soon be raised by the news media about the safety of dental amalgam," cautioned Dr. Sigfstead in his letter. "This may come in the wake of news, confirmed by the German Dental Association, that Germany is placing further limitations on the use of amalgam, including banning its use for pregnant woman as of July 1, 1995. Closer to home, amalgam safety may be questioned following the release of a Health Canada report scheduled to be made public in late June or sometime in July."

It is widely anticipated that the Canadian report will propose a recommended daily total intake for mercury, and that it could include limitations on the use of dental amalgam.

Despite its broad scope, and its obvious implications for dentistry, the dental profession has not been widely consulted about the report. It was researched and written for Health Canada by Dr. Mark Richardson based solely on a review of the scientific literature.

"CDA's most consistent advice to government has been to support further definitive research into dental amalgam," wrote Dr. Sigfstead.

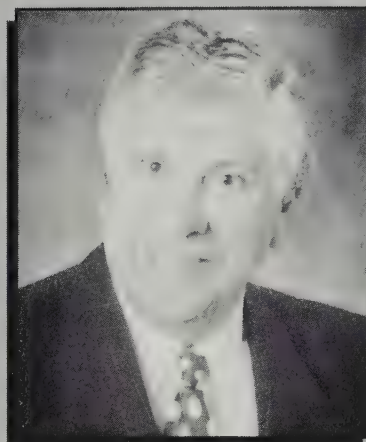
CDA is also questioning the methodology and baselines used in Dr. Richardson's study. Although the author accepted an invitation to present a full review of his methodology to CDA's committee on den-

New Brunswick Dentist Receives Honorary Degree

Dr. Leesha Gregory Zed of Saint John, New Brunswick, has received an honorary degree from Dalhousie University in recognition of his commitment to patient care, continuing education and community service.

Dr. Zed has practised general dentistry in Saint John, New Brunswick, since 1957, the year he graduated from the University of Toronto's dental faculty. Active in dental association affairs for many years, he is currently an honorary life member of the New Brunswick Dental Association, and a fellow of both the International College of Dentists and the American College of Dentists.

Despite his own success, Dr. Zed's biggest source of pride are his seven children, who have collectively earned 18 degrees encompassing 57 years of university training — 47 of them in the halls of Dalhousie University. Two of his offspring are dentists: Dr. Susan Barry, a 1983 Dalhousie graduate, practises with



Dr. Leesha Gregory Zed

her father in Saint John; Dr. Christopher Zed, who graduated from Dalhousie in 1994, maintains a dental practice in Vancouver.

Dr. Zed was presented with his honorary degree May 26, during Dalhousie's convocation exercises. He is also the recipient of Dalhousie's Continuing Education Silver Award, and in 1990 he was named the alumnus of distinction from the faculty of dentistry at the University of Toronto. ■

tal materials and devices, he left the April 28 meeting early and refused to disclose the titles of the pivotal papers that he used to establish his baselines.

In response to CDA's concerns, Health Canada has invited the association to name a representative to the review panel that will critique Dr. Richardson's paper prior to its release. Dr. Ross McCurdy, a respected researcher, has agreed to participate in the review process on CDA's behalf.

Health Canada is responsible for judging the safety of the dental materials used in Canada, including dental amalgam. While CDA has no regulatory authority, the association regularly monitors the literature and advises members on the safe use of dental materials. CDA also develops position statements, policies, and guidelines on the use of dental materials. ■

CDA Announces Launch Date For PSR Program

CDA's new Periodontal Screening and Recording Program will be launched August 26-29 during the association's annual convention in Ottawa.

Designed to be part of the regular patient examination, PSR allows dentists to screen their patients for periodontal problems quickly and accurately, and provides them with a simple, effective charting system to record their observations.

The PSR program consists of a special, color-coded periodontal probe and a unique charting system that records the periodontal scores from six sextants of the patient's mouth.

Using the probe, the dentist can identify up to five different catego-

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ries, or codes, of periodontal disease. Once the highest code for each sextant is determined, it is recorded by the dentist using a simple, box-chart format.

CDA's PSR program is based on a similar project that was developed by the American Dental Association, the American Academy of Periodontology, and Procter and Gamble in the United States. The Canadian program goes one step further, however, by providing dentists with a model for collaborative and responsible periodontal therapy. In general terms, the model explains how the general dentist can use PSR to "determine how the patient's care should be directed throughout the course of treatment," and acts as a guide to assist in future treatment decisions.

The launch of PSR in Canada is a joint initiative of CDA, the Canadian Academy of Periodontology, and Procter and Gamble Canada Inc., which has provided program funding.

Full details on the PSR program will be provided in the July-August issue of *Communiqué*. ■

National Dental Internship Recognition Program Established

The Canadian Dental Association has established a national dental internship recognition program and registry of graduates.

Initiated in 1994, the program recognizes graduates of hospital dental internships or fellowships, as well as graduates of general practice residency programs accredited by the Commission on Dental Accreditation of Canada.

Graduates who apply to the National Dental Internship Recognition Program receive a framed certificate of recognition, and their name is added to the national registry.

Both dental internships and hospital-based general practice residency programs provide young dentists with practical experience that goes above and beyond their undergraduate studies. Usually of a one-year duration, dental internships provide dentists with an opportunity to increase

"WHAT'S IT?"

A number of people identified the *Journal's* April mystery item, the "ortholator," as a paralleling instrument for taking radiographs. Special thanks to Dr. Roy Ras-

mussen of Calgary, Alberta, who included a sketch of the ortholator, and explained how it was used in conjunction with the old cone-type of X-ray machine. ■



their clinical experience in a hospital milieu, and enhance their competence in the provision of services to patients who are medically compromised, including those with medical, mental or physical disabilities.

The National Dental Internship Recognition Program will also help health-care facilities, other institutions, and government to readily identify qualified candidates for employment, and increase dentistry's recognition from funding organizations.

Dentists who have successfully completed a dental internship, and would like more information on how to apply to receive their Certificate of Recognition, and have their name listed in the registry, are asked to contact Ms. Gay MacQuarrie, program registrar, at the Canadian Dental Association, 1815 Alta Vista Drive, Ottawa, ON K1G 3Y6. ■

The Inside Story: 100 Years of X-Rays

An extraordinary museum exhibit, "The Inside Story — 100 Years of X-rays," is currently on dis-

play at the McCord Museum in downtown Montreal.

Showing until November 12, 1995, the Inside Story traces the development of X-rays from their serendipitous discovery by Conrad Roentgen in 1895, to the wonder of the high-speed spiral CT-scan of today.

The guiding light behind the exhibition is Dr. Denis Melançon, a radiologist at Montreal's Neurological Hospital. Dr. Melançon, prompted by a long-time interest in the history of radiology, worked on the exhibit for over five years prior to its opening, which was timed to coincide with the General Conference on Radiological Sciences. The conference took place in Montreal during the first week of June.

Consisting of objects drawn from museums and institutions in Quebec and from across Canada, the exhibit uses displays of early scientific equipment, photographs and archival documents to recount the fascinating saga of the evolution of X-rays.

Visitors to the exhibit will witness the early events that changed the course of medical diagnosis and treatment, and have an opportunity to view first hand the

flexibility and accuracy of the images produced by today's modern imaging techniques, such as ultrasound, nuclear medicine and magnetic resonance. Many will be enthralled by the detail displayed in an image of a 3,000 year old mummy, as well as by how X-rays are used outside of medicine. ■

Quebec Dental Order Appoints New Executive Director

The Order of Dentists of Quebec (ODQ) has named Mr. Paul J. Thériault as its new executive director.

Appointed as the order's chief staff officer April 3, Mr. Thériault will assume responsibility for the day-to-day management of ODQ, and work closely with both the order's administrative council and its new president, Dr. Robert Salois.

Mr. Thériault has extensive management experience in the health-care sector, and has also



Mr. Paul J. Thériault

been active in a number of associations, including the Canadian Society of Association Executives (CSAE). Here replaces Dr. Pierre-Yves Lamarche, who recently retired as the order's executive director after 20 years of service.

A 1957 graduate of the University of Montreal's dental faculty, Dr. Lamarche received CDA's distinguished service award in 1992. ■

ERRATA

A typographical error on page 414 of the May 1995 issue of the *Journal* resulted in the appearance of Greek math symbols in the article "Effects of Home Bleaching On the Tissues Of the Oral Cavity" (Sterrett, J., Price, R.B. and Bankey, T. *J Can Dent Assoc* 61(5):412-420, 1995). The paragraph should have read:

"... Two patients exhibited a significant decrease, $p < 0.05$, in their PD (0.32 ± 0.26 mm) during the hygiene phase, while one patient exhibited a significant, $p < 0.05$, increase (0.31 ± 0.26 mm) during the treatment phase. There was no significant change in the RC, BI or the PI for any patient during either time period."

The *Journal* regrets the error, and apologizes to the authors for any inconvenience it may have caused. ■

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CDA/ADC

Mr. Barry Turner, President, and Mr. David Sculthorpe, Vice-President, of Warner-Lambert Canada Inc., and Dr. Bryun Sigfstead, President of the Canadian Dental Association, are pleased to announce Warner-Lambert's sponsorship of the CDA President's Dinner, held in conjunction with the Annual Meeting of the CDA Board of Governors and the 1995 Convention in Ottawa.

Warner-Lambert, maker of Trident Gum and Original, Cool Mint, and Fresh Burst Listerine Antiseptic Mouthwashes, extends its best wishes to the Canadian Dental Association, its President, Dr. Bryun Sigfstead, and incoming President Dr. James Brookfield.

Trident



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LIBRARY PACKAGE



During the month of July, the CDA Library is offering an information package on **ALTERNATIVES TO AMALGAM**.

The package contains a selection of current articles on this subject and is available to CDA members for a cost of \$5, plus applicable taxes.

To order a copy, and to receive a complete list of other library packages, call the CDA Library at: 1-800-267-6354 extension 223; or fax: 1 (613) 523-6574.

NEW ACQUISITIONS:

CDA members can borrow the following texts from the CDA Library for one month at a cost of \$5 each, plus applicable taxes — this includes return postage.

1. Cohen, L.K. and Gift, H.C. [editors] *Disease prevention and oral promotion*. Munksgaard, 1995.
2. Miserendino, L.J. and Pick, R.M. *Lasers in dentistry*. Quintessence, 1995.
3. Wise, M.D. *Failure in the restored dentition: management and treatment*. Quintessence, 1995.

ERRATA

There was an error in the authors' biographies that appeared following the article "Papillon-Le-fèvre Syndrome Associated Early Onset Periodontitis: A Review and Case Study" (French, D., Scott, H. and Overall, C.M. *J Can Dent Assoc* 61(5):432-438, 1995). Dr. Overall, not Dr. Scott, is an associate member of the department of biochemistry and molecular biology, faculty of medicine, University of British Columbia. Dr. Scott is not associated with the faculty of medicine. The *Journal* regrets the error, and apologizes to the authors for any inconvenience it may have caused. ■

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BOOK REVIEWS

Contemporary Esthetic Dentistry: Practice Fundamentals

edited by Bruce J. Crispin et al.

1994, Quintessence Publishing Co., Ltd.; 303 pages, 933 illustrations (color and B&W); \$120 (U.S.); ISBN: 4-87417-450-7

This book is designed to provide an easy-to-access source of information about contemporary, single-tooth esthetic techniques and materials for the general dentist.

A discussion of non-restorative esthetic procedures and direct intra-coronal restorations takes up about one-third of the book. Esthetic procedures include bleaching, micro-abrasion and esthetic contouring, while the section on restorations contains an informative and up-to-date chapter on composites, glass ionomers and bonding to tooth structure. Surprisingly, the challenging techniques of direct veneering, diastema closure and Class II posterior composite restorations are given very little consideration, and all practical applications are covered in 14 pages. Dentists looking for detailed, practical techniques to help with direct posterior composites and veneers will be disappointed, as fairly rudimentary information is provided.

The second half of the book is devoted to indirect esthetic restorations. In an intermediate chapter that presents indirect composite inlay restorations, the authors' emphasis and philosophy emerge: "Techniques utilizing bonded ceramic have supplanted those involving indirect composite, particularly with respect to anterior veneers."

The remainder of the book, not surprisingly, is dedicated to all-ceramic restorations including inlays/onlays, full crowns, and veneers. Ample chapters, with excellent quality illustrations, cover preparations, communications with the laboratory, try-in procedures and resin cementation. In particular, the section on anterior porcelain veneers is excellent. It has a great deal of practical detail — including some clear advice, with diagrams, for the veneering of malpositioned teeth — and describes many successfully treated clinical cases.

An initial short chapter on ceramic materials — with emphasis on newer, high strength porcelains — is organized and easy to read, but lacks more critical material science and property information. This book alone would not provide sufficient knowledge for dentists who are unfamiliar with the new all-ceramic modalities. Technical laboratory procedures for the different classes of ceramic are briefly covered. An appropriate note of caution is included with regard to the lack of long-term clinical data for some of the full-veneer esthetic treatments presented.

The authors strongly advocate computer imaging for esthetically-oriented practice. In an opening chapter, which contains a reasonable approach to marketing, the authors emphasize the advantages of patient self-visualization. Computer imaging is presented as the dentists' mode of communication, not only in the competition for discretionary dollars, but also to define treatment goals and limitations. A high quality clinical camera is also considered essential. It is interesting that the reasons given for this include not only the production of "photo-walls" and a permanent record of the pre-operative condition, but also that it is a method of operator self-evaluation.

This book would be of value to the general practitioner who wishes to develop a more esthetic practice emphasis. It provides information on contemporary treatment modalities in an easy-to-read format, with a particular emphasis on ceramic restorations.

Reviewed by:

Dorothy McComb, BDS, M.Sc.D., FRCD(C); Professor and head, restorative department, faculty of dentistry, University of Toronto.

Periodontal Examination

by Jan Egelberg and Anita Badersten

1994, Munksgaard; 88 pages, 50 illustrations (40 in color); ISBN: 87-16-11376-4

The Swedish brother and sister team of Jan Egelberg and Anita Badersten has a history of producing educational material for dentists, dental auxiliaries and hygienists. After a short hiatus, they have collaborated again to produce a short and clear description of what to look for during a clinical

periodontal examination. This 88-page book is filled with many excellent full-color photographs, which are accompanied by a clear and concise description of the various stages that normal tissue undergoes as it changes to gingivitis and periodontitis.

The book is made up of several short chapters beginning with "The Healthy Periodontium," and covers such topics as dental plaque, tooth mobility, gingival recessions, and alveolar bone changes. The paragraphs are well indexed, and there is an extensive glossary at the end of the book that explains various terms to those who are removed from direct service (e.g. receptionists).

In keeping with the book's instructional aspect, there are schematic diagrams and radiographs to support the text, and at the end of each chapter, a short list of questions to test the reader's comprehension.

While the book might be thought of as a text, it should be pointed out that there are no references at the end of each chapter, and little discussion on the procedure of a periodontal examination. Nevertheless, it is concise, easy to read and understand, and well-illustrated. It would be very helpful to dentists, hygienists, and dental auxiliaries, and would serve as a useful book in any dental curriculum or dental office.

Reviewed by:

Kenneth H. Wright, B.Comm., DDS, Dip. Perio.; Clinician, faculty of dentistry, University of Western Ontario.

VIDEO REVIEW

The Skills of Daily Mouth Care: A Care-giver's Guide Video

1990, Dental Health Video Source Inc. 23 minutes, \$64(U.S.)

This instructional video and the accompanying manuals are designed to be used for teaching seminars on how to provide oral hygiene for dependent older adults. The primary target audience is nurses and nurses' aides in long-term care facilities, although it would be appropriate for any institutional or hospital setting. Other potential target groups would include home-care workers and families who care for

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dependent/handicapped adults or children, and nursing or nurses' aide students.

The 23-minute video is enhanced by four instructional manuals. A program guide provides information on how to conduct an oral hygiene instruction seminar, with both pre- and post-seminar tests. The care-giver's guide booklet summarizes the video presentation, provides some additional information, and answers to the pre- and post-seminar tests. A xerostomia (dry mouth) handout describes symptoms, risks and management techniques for xerostomia. This handout was an added inclusion, because xerostomia is not mentioned in the video or the care-giver's guide booklet. The final component is the dental observation/dental report form, which is a standardized communication form for nurses and consultant dentists.

Topics covered in the video include why mouth care is important, the supplies required for the care of dentate and edentulous patients, and the step-by-step methods of providing mouth and denture care. Mouth care delivery is shown for all

patients including comatose and bedridden patients; and aggressive patient management is discussed. Instruction is given in set-up, patient-positioning, brushing, flossing, lip lubrication, cleaning edentulous areas, tongue and palate cleaning, denture hygiene, and the recording and reporting of any oral anomalies.

This video presentation has many strengths and few weaknesses. Overall the video is positive and upbeat, reinforcing the importance of daily mouth care and how it can be accomplished with practise. All aspects of mouth care are dealt with in a concise manner for both dentate and edentulous patients, including bedridden, comatose and difficult to manage patients. Other areas that are covered include gingivitis and its appearance, the evaluation of dentures for fit and the presence of defects, and the importance of reporting any changes in the appearance of any oral tissues. The additional written instructional material more than adequately augments the video presentation.

Some criticisms of the video are that the brushing technique is pre-

sented too quickly. Further, chlorhexidine use was not addressed, although fluoride use was mentioned frequently. Chlorhexidine use was likely not mentioned due to the lack of information available at the time when the video was produced. Denture assessment to determine intra-oral fit was mentioned in the video, but no criteria to ascertain an adequate or inadequate fit was discussed. In addition, xerostomia was not covered in the video presentation, and was mentioned as an afterthought by way of a written handout. Newer editions should include chlorhexidine use and a discussion about xerostomia.

Overall, this video and the accompanying written material are a good instructional guide for the teaching of daily mouth care. Despite the few weaknesses mentioned, this video is highly recommended. Rating: nine out of 10.

Reviewed by:

Douglas Galan, DMD, M.Sc.; Geriatric dentist, community dentistry programs, faculty of dentistry, University of Manitoba.



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Insurance Claims: How To Make the Process As Smooth As Possible

Dr. James Wright, President of CDSPI

Just recently, I read a letter from a dentist who described his tremendous satisfaction with the excellent service he received from both Canadian Dental Service Plans Inc. (CDSPI) and the insurance company in settling his office claim. CDSPI receives letters and comments like this regularly. However, CDSPI and the insurer can't take all the credit. The truth is, the dentist plays the greatest role in making insurance claims go smoothly.

Of course, unless you — the dentist — understand your part in the claims process, it will be extremely difficult to succeed in this all-important role. So here's the claims information you need to know.

The first thing to understand is how many claims dentists actually make. Once you read the statistics, you'll realize that if you haven't made a claim yet, there's a strong possibility that you will make one some day. Consider these 1994 statistics for participants in the Canadian Dentists' Insurance Program: one in 11 dentists made an office claim, one in 25 dentists made a disability claim, and one in 23 participating dentists (excluding those in Ontario and Quebec) had a malpractice claim. In fact, the 13,170 dentists who partici-

pated in the Program during 1994 made a total of 1,434 claims — an average of one claim for every nine dentists.

These statistics certainly underline the importance of understanding claims, and knowing the right steps to take. Your first move is to report accidents or other incidents to CDSPI right away. This may seem like common sense, but you'd be surprised how many claims get delayed — and sometimes denied — because this step isn't taken.

Take accidental death and dismemberment insurance for example. Let's say that a dentist suffers the loss of use of a hand. Knowing that "loss of use" must continue for one year before benefits can be collected, the dentist may not be inclined to report the situation in any great hurry. That's a mistake. The dentist should inform CDSPI of the problem immediately. CDSPI must provide the underwriter with written notice of the claim within 30 days of the accident, or the dentist will no longer qualify for a claim.

Another example is malpractice. If you have malpractice insurance under the Canadian Dentists' Insurance Program, you should notify CDSPI as soon as you're aware of a potential

claim situation — do not wait until you are issued a writ.

Reporting immediately is equally important with long-term disability insurance. For example, you may think that your disability won't last longer than your elimination period (the period you must wait before benefits begin), so you don't bother to report it. But you're advised to call CDSPI at the onset of an illness or when an injury occurs, even if you think it's minor. Complications could arise, or the disability could prove to be partial and you may qualify for partial benefits.

Complete All Paperwork

Another important step in long-term disability claims is to complete your paperwork properly. Filling out forms — a chore at the best of times — is not a pleasant task when you're suffering a disability, but it's crucial if you want your claim processed in good time. Fortunately for dentists, CDSPI's claims staff are just a phone call away. Their assistance can help take much of the work out of paperwork.

Disability claims require information on your income — a request some claimants don't understand. This income information is used to determine the amount of benefits that you are

entitled to receive for partial disabilities, which is based on a percentage of lost income, as well as to verify that your pre-disability income entitles you to the benefit being claimed. It's essential that you complete this part of the claim forms.

If you have to file a disability claim, remember that you're not restricted to the forms alone. If there is information you wish to add, including any special circumstances concerning your disability, feel free to attach additional notes.

Also, if you report your disability immediately, and send in your forms and documentation on time, you can receive your first disability cheque in as little as

three weeks after your elimination period. This advice about long-term disability insurance also applies to office overhead expense insurance claims, which are triggered by a disability.

While personal insurance claims demand action as soon as covered situations arise, the office insurance claims process begins even sooner. Yes, you actually have to prepare for claims before they happen. Away from your office, you should keep a complete list of your office contents (ask CDSPI for an Office Contents Inventory & Valuation form), and — ideally — either photographs or a video of your equipment and furnishings,

along with invoices for all purchases. The more complete your records, the easier your office claim will be.

Most personal and practice claims go smoothly. When problems arise, they usually stem from two common mistakes. One is incomplete information. You must answer all questions and provide all requested documentation. If you don't, the processing of your claim could be delayed or it could be denied out-right. The other common mistake is not having adequate records to back up a claim — a problem especially relevant to office contents claims. These problems are easily preventable, so please pay proper attention to both matters.

CDA RETIREMENT SAVINGS PLAN

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(Checks indicate Superior Performance Compared to Industry Averages*)

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	CDA	Other*	CDA	Other*	CDA	Other*	CDA	Other*
Aggressive Equity	-9.8%	-2.9%	n/a		n/a		n/a	
Common Stock	1.3%	4.1%	10.6%	11.4%	✓ 8.6%	8.1%	✓ 9.7%	8.2%
Balanced	7.0%	7.2%	8.4%	9.8%	9.3%	9.4%	✓ 9.3%	8.4%
Bond & Mortgage	10.8%	11.1%	✓ 8.8%	8.2%	✓ 11.6%	10.7%	✓ 10.3%	10.0%
Money Market	✓ 6.4%	5.5%	✓ 5.4%	4.9%	✓ 7.3%	6.8%	✓ 8.4%	8.0%
International Equity	✓ 9.1%	0.4%	n/a		n/a		n/a	
European	✓ 23.9%	8.5%	n/a		n/a		n/a	
Pacific Basin	✓ 1.3%	-6.7%	n/a		n/a		n/a	
Emerging Markets	✓ 7.7%	-14.9%	n/a		n/a		n/a	

[†] CDA figures indicate annual compound rate of return with all fees deducted. The figures are historic rates based on past performance and are not necessarily indicative of future performance.

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Memorabilia from CDA's 92-year history is now on display in antique cases in the library of the Canadian Dental Association headquarters in Ottawa.

As originally planned, the displays are changed on a regular basis to suitably depict different eras of our rich dental history. Donations of museum-quality dental artifacts are still being accepted and are very much appreciated. Particularly requested are larger items such as chairs, units, cabinets and X-ray machines, plus historical photos and records.

Also of interest to dental historians are the items highlighted in the column entitled "What's it?" which appears monthly in the Journal. This column elicits the help of readers in identifying some of the antique items presently on location in the museum.

For further information, contact Dr. Ralph Crawford at the Canadian Dental Association, 1815 Alta Vista Drive, Ottawa, Ontario, K1G 3Y6. (613) 523-1770, or call toll-free 1-800-267-6354.

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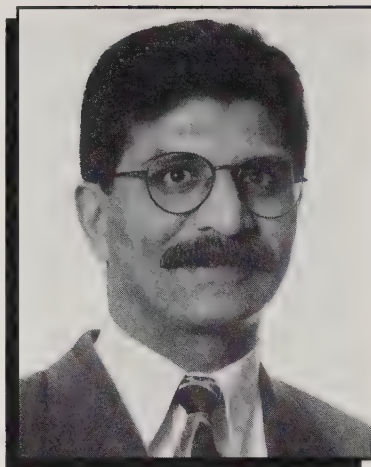
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Redefining Success in Dentistry

Imtiaz Manji, B.Sc.

Principal of ExperDent

Do you ever find yourself sitting in a practice management lecture, anxiously waiting for a discussion of production levels so you can see whether you “measure up?” It seems that some dentists have taken to determining what is appropriate in terms of their gross and net income by extrapolating from lectures’ examples of hypothetical practices. I, for one, have had dentists approach me after a lecture to say that they are all but “failing” because they haven’t achieved the production levels I referred to in illustrative examples. But, I reply, “they’re only examples.”

This trend worries me in the same way that I become concerned when a dentist complains of lower production levels than fellow colleagues. Have some dentists become so focussed on production that achieving that magic number, whatever it may be, is synonymous with success? Has production become the sole yardstick for achievement? Such a narrow definition of success is dangerous, both to patients and the dental team. When money becomes the only focus, it is the beginning of failure not success.

This isn’t to say that running a profitable practice isn’t necessary. Like any other profession, dentists must make a living by providing a highly skilled service. It’s just that

profitability cannot come at any price — it must be a by-product of practising honest, patient-driven dentistry. Furthermore, profitability alone, though easily measured, does not define success. It is but one contributing factor under the umbrella of success.

Success means different things to different people. The following examples include a mix of components — some of which lend themselves to measurement — that can bring long-term satisfaction in practising dentistry. (You’ll notice the implicit message: financial success in dentistry begins with achieving success with patients.)

High Quality Patient Care

Providing quality oral health care to patients is the cornerstone of dentistry. This is truly the *raison d’être* for setting up a practice. In practical terms, this means that you deliver a quality service to patients, a service that is dictated or driven by the needs or wants of patients. (In other words, your need to fill the appointment book, or worries about practice overhead, have no impact on patient treatment.) In focussing on the patient, you witness an improvement in their oral health, and smiles, which provides both you and the patient with a sense of pride and well-being. But the reality is that

patients generally don’t understand the quality of care you’re providing; they can’t tell good dentistry from bad. However, patients do understand the *feeling* of quality. So how you and your staff feel about the dentistry being delivered is extremely important. If you’re proud of the quality, this is the first foundation or building-block of success — and one which can be communicated to patients to create value for your services.

Patient Satisfaction

Successful dentists have practices that are rewarded with a high level of patient retention. This means that patients value the treatment provided and are partners in their oral health. As such, they return to the practice for continuing care appointments and preventive care education, which is provided by the hygiene department. You can measure patient retention by comparing how many appointments are needed with how many you are providing. For instance, if you have 2,000 charts, and 4,000 appointments per year are needed to meet patients’ needs, determine how many of those appointments are being made and kept. (Please note that two appointments per-patient per-year is just an example for the purpose of planning. Some patients need one, two or

three appointments, etc. per year and it is their mouths which determine this. Also, this example excludes the hygiene needs of new patients.) Because satisfied patients are confident that the dentist's treatment recommendations are based solely on their oral health needs, they are inclined to accept treatment. They also respect the dental team's time and make a point of being on time for their appointments. Satisfied patients pay you the greatest compliment by referring new patients to you. (See below)

Staff Retention

Staff turnover is seldom a problem in successful practices. In fact, you're likely to see many long-serving employees in these environments. Staff value the excellent care provided by the dentist, and this excellence serves as a model for other team members. The appreciation they receive from the dentist also counts a great deal. (Studies have shown that even handsome remuneration isn't enough to keep employees happy. They need to be appreciated and respected by their employer.) Happy staff are instrumental to building success within a practice, because they are responsible for steering patient visits in the right direction. As the dentist, you can only do so much — your team carries most of the load — so make sure your team is on side by adhering to open communication (including regular staff meetings); providing effective leadership; and rewarding them for a job well done. You'll find that they'll respond with motivation and accountability, and they'll market your practice to achieve patient retention and case acceptance. On top of all that, numerous patient referrals will also come your way.

Quality Referrals

Notice that I didn't attach a number to the referrals that successful practices need. That's because, like production levels, this varies from practice to practice. Because successful practices re-

tain most of their patients, they tend to need fewer new patients to keep their practices buoyant. (But interestingly, because these practices have mastered patient retention, they get high new-patient flow from the referrals of their existing patients who value the care provided.) They focus on keeping patient attrition to a minimum (although every practice has inevitable patient loss due to relocation, death, etc.) in order to avoid the revolving door syndrome (same number of patients leaving as new patients arriving). Although new patients are still necessary for successful practices, their teams tend to focus on the type of new patients they're getting, as opposed to sheer numbers. If quality patients are referring their friends, family and colleagues, you can generally expect that these individuals will also become quality patients.

Stress-Reduced Environment

I wouldn't say that successful practices are stress-free — a certain amount of stress is inherently involved in the practise of dentistry — but there are definitely opportunities to minimize the stress of the profession. It's too huge a subject to cover here, but, in essence, low stress practices tend to share the same characteristics. They have organized, proactive dental teams who communicate effectively and generally stay on schedule, and patients who are punctual and understanding, who respect the practice's financial policy, and are educated participants in their oral health. These practices boast dentists who truly look forward to going to work.

Financial Comfort

It would be remiss not to include financial matters as part of the success equation. Profitability is necessary to keep your practice afloat, but it certainly can't be achieved through "maximizing" insurance or patient needs. Financial success is the natural by-product of achieving success in the aforementioned areas.

In terms of revenue, only you know what revenue is needed to allow you to meet your expenses and pay yourself a reasonable salary (at the very least, what you would pay an associate). Determining this figure — a figure which is unique to your practice situation — begins by pinpointing your overhead. Ideally, your overhead will consume 55 per cent, or less, of your practice's gross revenue. If you're at this level already, great. If not, take a look at how you might be able to get better control of your overhead, be it through increasing your revenue or reducing your expenses. Give yourself a three- to five-year period to achieve this and look to your financial advisors for help in this regard.

Stimulation and Enjoyment

Not surprisingly, most contented dentists recognize that lifelong success can be redefined throughout their careers. What brings fulfilment will change over time as opposed to being static. Boredom can sabotage success and that's likely why you'll find the most engaged dentists are the first to embrace the dynamic nature of their work, and of life in general. Successful dentists thrive on continuing education and learning about the latest technological advancements, and integrating these into their practices. (In other words, they are concerned with continuing education for the sake of learning, not as a means to achieving their mandatory education requirements.) Whether it's the use of lasers and intra-oral cameras in the clinical side of their practices, or the introduction of chairside computer terminals to aid the administrative process, these dentists greet the new and unfamiliar as a challenge, not as something to be feared.

Balanced Life

I'm certainly not the first, and I won't be the last, to state the importance of a balanced existence in which work, family, play, etc. all have a part. In fact, balance is





a great indicator of success. In other words, the dentist who works an inordinate number of hours, rarely takes a vacation, and misses out on important family functions, all in the name of financial empowerment, may be accumulating wealth, but it comes at a cost. No matter how much you may enjoy and be devoted to dentistry, it threatens your ability to experience success if it's your only focus.

Follow Your Own Path

The above points are merely examples of strategies that, when mixed together, can yield success. But it's not a fixed recipe, it's just some guidance. Each dentist and practice is unique and so the ingredients of success must be individually determined. What works for one situation may be inappropriate for another. But there is a common thread: no definition of success can be measured on monetary terms alone. When financial return becomes the sole focus of a dentist, you can be sure that both patients and staff will eventually perceive this and the consequences will be dire for the practice. Don't let the speculation — or even the confirmation — of your colleagues' annual production be the yardstick of your success. And certainly don't extrapolate from lecturers' examples. As I said at the beginning, they're just that — examples. Follow your own well mapped-out path and you'll likely get to your destination. ■

DID YOU KNOW?

Imagination was given to man to compensate him for what he is not; a sense of humor, to console him for what he is.



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BOARD OF GOVERNORS

NOTICE OF MEETING

Annual Meeting

The Annual Meeting of the Board of Governors of the Canadian Dental Association will be held August 25 and 26, 1995 (Friday and Saturday), at the Westin Hotel, Ottawa, commencing at 9:00 a.m.

It is brought to your attention that meetings of the Board of Governors are open to all members of the Association.

The Board is composed of twenty-six governors with voting privileges and a Chairman. Governors represent members across Canada on a 1 to 500 ratio. The Canadian Forces Dental Services, Student members and Affiliate members from Quebec are represented by one member each.

In addition, there are two non-voting members, namely, the senior dental representatives of Health Canada and Veterans Affairs Canada.

A complete listing of the Board of Governors follows:

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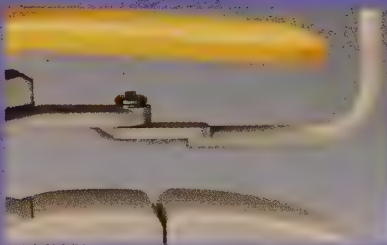
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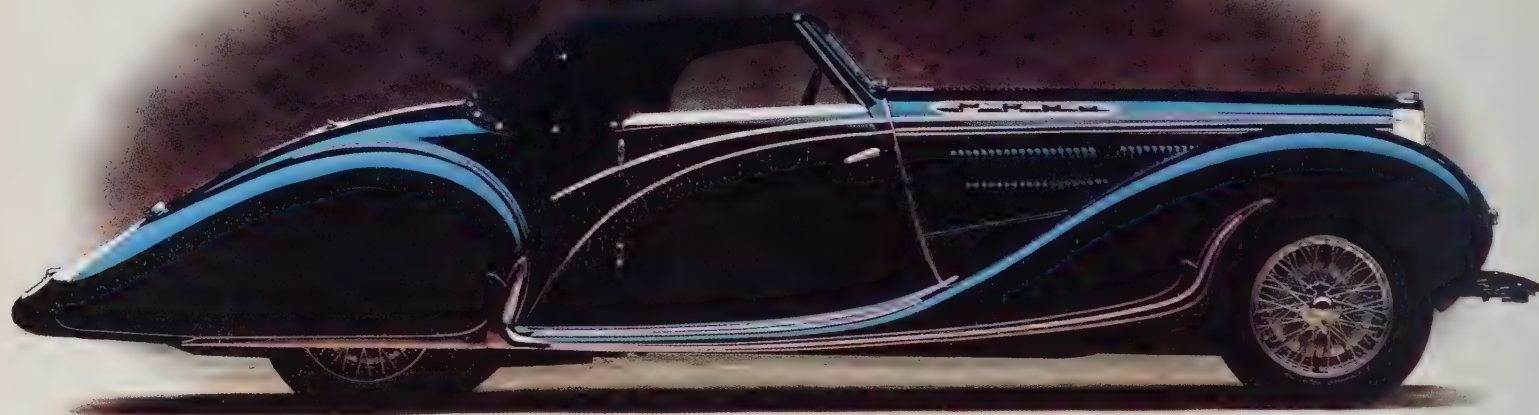
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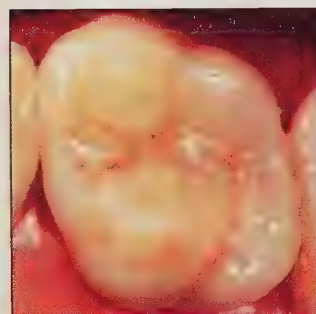
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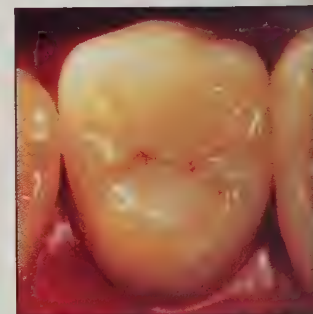
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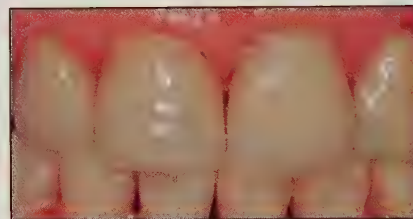


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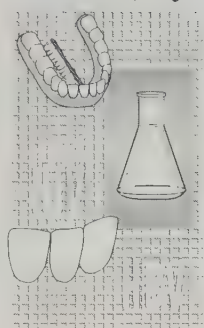
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FEATURE



Canada's Laboratory Centre For Disease Control

Terence Davis, BA, Dip. J., CAE

In 1990, the Centers For Disease Control and Prevention (CDC) in Atlanta set off a chain reaction that ultimately changed the face of dentistry when it first reported that Florida dentist Dr. David Acer may have been the source of Kimberly Bergalis's human immunodeficiency virus (HIV) infection.

With the release of CDC's findings, and the intense media scrutiny that followed, infection control became the profession's watchword for the '90s. Universal precautions, including the use of gloves, gowns and masks, soon became routine in dental practices across Canada and the United States. But while compliance with universal precautions remained largely voluntary in Canada, in the U.S., despite the minuscule risk factors identified by CDC for the transmission of HIV from dentist to patient, the Occupational Health and Safety Administration (OSHA) implemented strict infection control guidelines.

CDC introduced the concept of universal precautions in the mid-1980s, when AIDS and HIV became established as significant medical and social problems.¹ Mounting professional concern soon led to the development of more formal infection control recommendations to protect health-care workers from contracting HIV through occupational exposure. These recommendations, pro-

claimed by CDC in 1987,¹ were ultimately adopted by many Canadian and U.S. health-care associations, including CDA, which released its own "Recommendations for Infection Control Procedures" in 1988.

With the media hype surrounding the Kimberly Bergalis case, and the subsequent revelations that Dr. Acer may have infected as many as six of his patients with the HIV virus, CDC has stayed in the media spotlight for most of the '90s. It has also been widely cited in the literature, by both U.S. and Canadian authors.

At the same time, even though it developed and published its own "Canadian Guidelines for Universal Precautions" in the mid-'80s, shortly after CDC proclaimed its recommendations, the work of Canada's Laboratory Centre For Disease Control (LCDC) has remained relatively unknown among the dental community. This is unfortunate. LCDC is a resource that remains to be tapped to its full potential by both individual dentists and the dental profession.

LCDC's mission is "To be the national centre for the identification, investigation, control and prevention of human disease."² In a broader sense, as one of five directorates in the Health Protection Branch of Health Canada, it also plays a role in protecting "the Canadian public from health risks posed by microbial, food-borne,

drug-related or environmental hazards."

The centre is organized around four bureaus: the Bureau of Communicable Disease Epidemiology; the Bureau of HIV and HTLV Laboratories and Research; the Bureau of Microbiology; and the Bureau of Chronic Disease Epidemiology.

From a dental perspective, the Bureau of Communicable Disease Epidemiology and the Bureau of Chronic Disease Epidemiology are probably the most important of the four bureaus. The Bureau of Communicable Disease is directly involved in the development and evaluation of hepatitis and HIV prevention and control programs, as well as in the development of vaccination protocols and recommendations. Similarly, the Bureau of Chronic Disease Epidemiology is responsible for monitoring and analyzing "the full spectrum of Canada's vital and health statistics,"² in addition to conducting research on the occurrence and causes of both occupational injuries and major chronic diseases. The resulting data are used "to provide policy makers and public health officials with scientific guidance."²

Despite its name, much of LCDC's work is done outside the laboratory. The emphasis is on surveillance, generally in partnership with provincial laboratories across Canada, but also with distinct oc-

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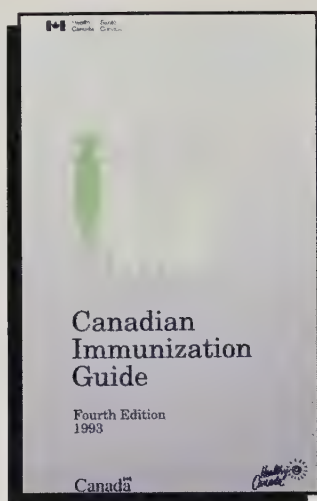


Fig. 1: The Canada Immunization Guide.

cupational groups such as hospital workers. This "core" activity is primarily focused on the 45 diseases that are currently notifiable in Canada, including hepatitis A and hepatitis B. Although hepatitis C is not yet notifiable in all provinces and territories, some provinces also report cases of this disease to LCDC.

The reporting process depends largely on the "sentinel" surveillance programs that LCDC has developed in cooperation with Canadian provinces and territories. These programs allow selected hospitals and health units to report occurrences of targeted diseases, health conditions, or injuries directly to the centre.

An example of one such program is the recently established Sentinel Health Unit Surveillance System, which provides LCDC with data on the number of identified cases of each disease under surveillance in the various reporting areas, the gender and age group of the affected patients, and information on risk factors. It's a cooperative process, with provincial/territorial epidemiology laboratories and nine public health units located in six provinces all working toward a specific, recognizable goal: to identify and clarify risk factors, and to work with both health groups and individuals to determine how to best manage these risk factors.

If enough data is obtained through LCDC's surveillance activity, and manageable risk factors

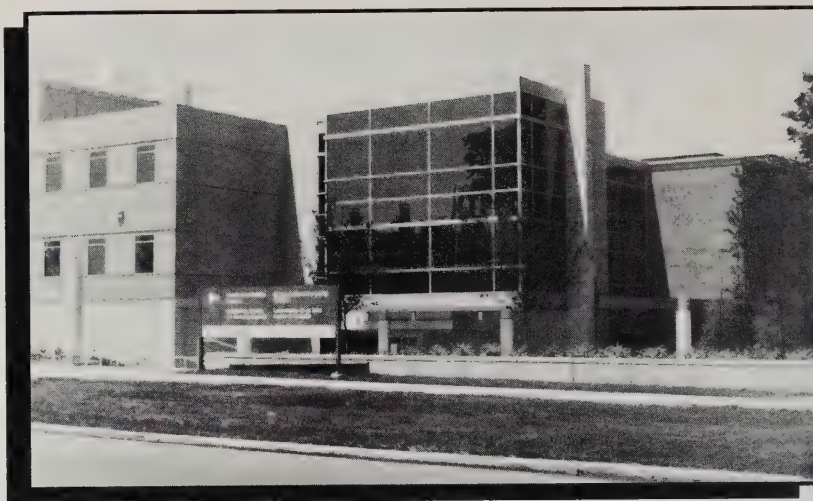


Fig. 2: The Canadian Laboratory Centre for Disease Control.

can be identified, specific occupational guidelines are developed that could ultimately be recognized as standards of care. This is accomplished by bringing together a working group of experts to analyze the risk factors and then present recommendations on how these factors could be effectively managed. These expert recommendations are subsequently developed into comprehensive guidelines and published.

While LCDC has not yet published specific standards of care for dentistry, the role that CDA played in the development of the centre's December 1992 report on "Blood-borne Pathogens in the Health-Care Setting: Risk For Transmission" provides a good example of how the process works.

In 1991, public and professional concern about HIV transmission in the health-care setting created political pressure to respond to the issue. That led to a series of meetings, organized by LCDC, "to define areas of consensus among interested Canadian groups on issues related to transmission of blood-borne pathogens including hepatitis B virus (HBV) and HIV from health-care workers to patients/clients in a health-care setting."³ CDA participated in the process by hosting its historic conference on "The Impact of HIV and Other Infectious Agents On Oral Health Care."

The recommendations presented during CDA's conference

and at similar meetings conducted by other health-care organizations were compiled in LCDC's report, which was subsequently published in the *Canada Communicable Disease Report (CCDR)* as well as in the *CDA Journal*.³ In fact, the LCDC report examined a wide range of health-care issues, from testing health-care workers for HIV and HBV infection, to the need to revise, reorganize and expand LCDC's existing guidelines for universal precautions "in such a way as to facilitate adaptation to the specific needs of users . . . including professional associations, health organizations, health-care facilities and educators."³

The process of developing guidelines, or standards of care, takes about 18 months to complete. LCDC is currently collecting data on HCV transmission, and plans to establish a new surveillance program to monitor needle-stick injuries in health-care settings. The guidelines that result from this type of research could have direct relevance for dentistry, and could ultimately lead to the development of dental standards of care.

It's important to note, here, that LCDC has no direct regulatory authority vis-à-vis the dental profession. While it can develop and bring forward standards of care, or guidelines, it remains within the mandate of the provincial licensing bodies to judge the appropriateness of these standards and to

make the final decision on their implementation. LCDC's role, once guidelines are developed, is strictly advisory. The key to making the system work is to involve the main players at every stage of the process, and guide them toward a consensus or near consensus position. It's putting the experts in a room, and using their knowledge to develop a workable document.

In fact, LCDC faces several major obstacles with respect to developing standards of care for the dental profession. First and foremost, because most dentists practise in small or single-practitioner offices, it's difficult to conduct the ongoing surveillance required to identify occupational risk factors. In effect, surveillance would demand individual reporting by dentists, and would only be effective if a high level of compliance was achieved across the country.

This isn't the case in the hospital setting, where large numbers of health-care workers are housed within a single facility. LCDC is currently putting together a surveillance program to track the frequency of needle-stick injuries, identify the occupational risk factors, and monitor the incidence of post-exposure infection. The process is largely being driven by health-care workers themselves, using software distributed in Canada by the Canadian Hospital Association (CHA).

LCDC has also established a reporting system for health-care workers who become infected with AIDS via an occupational exposure, as well as a protocol for investigating these cases. To date, most incidences of HIV infection due to occupational exposure have involved laboratory workers. There have been no reported AIDS cases involving dentists.

In these cases, the initial investigation is typically carried out at the provincial level. LCDC's involvement often includes high-level diagnostic tests, such as DNA fingerprinting to isolate different strains of HIV, or polymerize chain reaction tests to establish the origin of the virus. The centre may also assist

in the initial epidemiologic investigation of the exposure, depending on the circumstances and the level of expertise available in the region where the incident occurred. It also frequently provides one-on-one counselling to physicians treating health-care workers who have been exposed to HIV.

Recently, LCDC worked closely with CHA to develop a working document on the elimination of CFCs from health-care facilities. This initiative, which resulted primarily from Canada's decision to ban CFCs, the principle gasses used in hospital sterilizers, could also have important implications for dentistry.

LCDC and CHA are concerned that sterilizers designed to work with CFC gasses, often ethylene oxide, may not be as effective if alternative gasses are used. This, in turn, may require hospitals to increase their use of cold sterilization techniques, and LCDC to develop new guidelines.

In many cases, LCDC becomes involved in the surveillance/guidelines development process at the request of an outside health-care organization such as CHA. For example, the centre would be unlikely to conduct research into the safety of dental amalgam unless mercury toxicity became an environmental or political issue, or a dental organization such as CDA expressed strong interest in the study.

The results of LCDC's ongoing surveillance activities, plus up-to-date reports on both disease outbreaks and the incidence of infection, are regularly published in *CCDR*, the centre's bi-weekly newsletter. *CCDR* is also used to disseminate the guidelines and recommendations developed by LCDC, and will eventually carry the results of the centre's planned consensus conference on hepatitis A, B, and C.

LCDC, through its Sentinel Health Unit Surveillance System, has been gathering data on viral hepatitis "to determine the incidence of and risk factors for viral hepatitis, to determine the personal and economic costs of the disease, and to evaluate current

control measures."⁴ Information from this study will be used to develop "national control guidelines."⁴

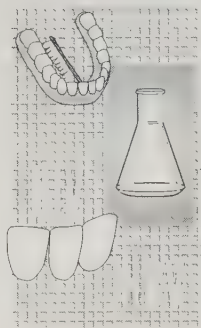
In addition to *CCDR*, every four years LCDC publishes the *Canadian Immunization Guide*. The fourth edition of this publication, printed in 1993, provides a comprehensive report on all aspects of immunization, including hepatitis B vaccine and vaccination against both hepatitis A and C. It also includes a list of "vaccines recommended for all health-care workers" and information on "immune globulins for specific risk situations."⁵ New or revised statements, released by the National Advisory Committee on Immunization during the four years between guide printings, are published in *CCDR*. Dentists can obtain copies of these statements by either subscribing to the newsletter (call: (819) 956-4802), or requesting them via LCDC's FAXlink service (fax no.: (613) 941-3900).

While LCDC now relies on provincial health units and laboratories to do much of the basic field work required by its surveillance activities, it still maintains a complex laboratory facility at its Ottawa headquarters. LCDC's Bureau of Microbiology "provides public health laboratories and tertiary care hospitals with state-of-the-art diagnostic and investigative laboratory services related to infectious disease," and is recognized as an international centre of excellence in enteric pathogens.² It is anticipated that the bureau will be relocated to new facilities in Winnipeg in 1997, however.

Similarly, the Bureau of HIV and HTLV Laboratories and Research "provides Canadian laboratories with a national diagnostic and expert reference laboratory for HIV and human T-cell lymphotropic viruses (HTLV) I and II."² In fact, the laboratory provides expertise in two main areas: the detection of HIV infection and the measurement of changes in the immune system related to HIV infection.

... Continued on page 578

FEATURE



Prescription Drug Approval In Canada: A Risk-Benefit Analysis

Terence Davis, BA, Dip. J., CAE

In the final analysis, the approval of a new prescription drug for sale in Canada depends on one overriding factor: a favorable risk-benefit assessment, indicating that the adverse drug reactions associated with the compound are outweighed by its therapeutic advantages.

It sounds simple, but introducing a new drug into the marketplace is not an easy matter. For every new drug that receives a notice of compliance from Canada's Health Protection Branch, thousands of compounds never make it past the development stage. At some point along the way — from synthesis, to screening, to preclinical testing, to Phase I, II, and III clinical evaluation — these drugs

fail to demonstrate the activity, safety and efficacy required to meet the standards established by the Bureau of Human Prescription Drugs (BHPD).

Drug approval in Canada is based on a risk-benefit assessment. In effect, after a manufacturer has synthesized a new compound, undertaken appropriate preclinical and clinical testing, and prepared a new drug submission, BHPD reviews the assembled data to ensure that the new drug is as safe and efficacious as the manufacturer claims.

Once the bureau receives a new drug submission, the review process may take up to 365 days to complete. Although the amount of time required to obtain a notice of

compliance remains a concern for many manufacturers, the bureau has actually made tremendous strides in this area over the last year or two. Today it takes no longer to obtain approval of a new drug in Canada than it does in most other jurisdictions, and in some cases even less time is required.

For the bureau, the drug approval process involves an intensive review of scientific information, with reviewers pouring over the submitted data to identify any inconsistencies or areas of concern. If they locate a potential problem, the manufacturer will be asked to submit additional data to clarify the specific concern.

A new drug submission must contain five specific elements: a

Continued from page 577...

Working together, LCDC's four bureaus allow the centre to analyze provincial data from a national perspective, and translate this information into workable national health strategies. Like the hub of a wheel, LCDC forms the nucleus of a strong, uniquely Canadian, public health network. The centre may not have the media exposure of its cousin to the south, but it has similar levels of expertise and

know how — all geared toward the Canadian health-care delivery system. ■

Acknowledgements: The author wishes to thank Dr. John Spika, Dr. Paul Gully, Ms. Maura Ricketts, Ms. Eleanor Paulson, and Ms. Shirley Paton, from the bureau of communicable disease epidemiology, LCDC, for their assistance in the preparation of this article.

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master volume, containing administrative documentation as well as the product monograph; information on the compound's chemistry and manufacturing; a comprehensive summary; sectional reports; and raw data. While all of this information is important, the key area of interest and concern for the bureau is the sectional reports, which provide a detailed description of each animal and clinical study on the new drug, and include both qualitative and quantitative data. They also provide demographic data for each patient, as well as data supporting the efficacy and safety of the new drug.

The comprehensive summary provides an overall review of both preclinical and clinical studies involving the pharmacology, toxicology, reproductive toxicology, pharmacokinetics and clinical effects of the drug.

Based on a careful risk-benefit analysis of all the data, the bureau identifies potential areas of concern that need to be investigated more closely. For example, if a dental anesthetic caused the mean blood pressure of trial participants to fall from 120/80 mm Hg to 110/68 mm Hg, the reviewer would likely ask the manufacturer to submit data on individual patients. While the drop in mean blood pressure is not that significant on its own, the systolic and/or diastolic pressures of some patients may have dropped to a level much lower than the mean pressure.

Before the safety and efficacy of the new drug can be realistically judged, the bureau would need to know the systolic and diastolic pressures of the most affected patients, as well as the demographics of these individuals. The next step would be to determine if specific patient groups were more likely to experience a severe fall in blood pressure than others, i.e. was the drop in blood pressure significant only in participants with predisposing characteristics such as low

body weight or advanced age, or did it affect all participants in the study group.

By law, drug manufacturers are obliged to describe everything that occurs in their preclinical and clinical studies. This data may be gathered in Canadian or non-Canadian trials, as long as the trial is conducted by an experienced clinician according to the highest scientific, medical and ethical standards. If non-Canadian data is submitted, however, the bureau may weigh the rating scales that were used, to evaluate the impact of cultural influences and other factors on the trial.

If a drug has already been approved in other jurisdictions, the bureau will examine the prescribing information used in these countries, as well as any changes that have occurred in the prescribing information over time. This investigation may identify problems or legal concerns that have arisen with respect to the use of the drug elsewhere, which may be critical to the bureau's risk-benefit assessment.

Prior to conducting clinical trials in Canada, the manufacturer must submit an investigational new drug (IND) submission. The next step is the new drug submission (NDS), which is generally made at the conclusion of appro-

priate Phase I, II, and III clinical trials. In all cases, the trials must be conducted according to guidelines acceptable to BHPD.

As part of its review process, the bureau defines the safety measures that must appear in the drug's product monograph, including contraindications, warnings, precautions, adverse reactions, and appropriate dosage recommendations. It will not issue a notice of compliance unless it is satisfied that the risks outlined in the monograph are offset by the benefits provided by the drug.

Once a drug has received a notice of compliance, and has been introduced to the market, the manufacturer must report any subsequent adverse reactions to BHPD. Depending on the extent and severity of these reactions, the bureau may suspend the notice of compliance for the drug, or require the product monograph to be changed to alert health-care professionals to potential concern.

It may not be a perfect process, but Canada's drug approval process ranks among the best in the world. ■

Risk / Benefit Assessment

Efficacy / Safety / Quality



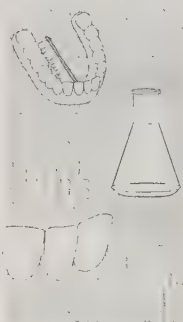
* Adverse Reactions
* Vital Signs
* Laboratory Abnormalities



Contraindications
Warnings
Precautions
Adverse Reactions
Dosage

Acknowledgements: The author wishes to thank Dr. K. Voith for providing information on the drug approval process, and for reviewing this article prior to publication.

FEATURE



Dental Devices: The Dangers Of Cross-Border Shopping

Terence Davis, BA, Dip. J., CAE

T rue or False: The federal government inspects, examines and approves every dental device before it's offered for sale to Canadian dentists?

False: Unless a device or material is designed to be implanted in the human body for more than 30 days, and will be in contact with vascular tissue, dental manufacturers do not have to seek government approval to market the product. Instead, within 10 days of first sale, they must inform the Medical Devices Bureau (MDB) of their intent to continue selling the device or material in Canada.

True or False: Cross-border shopping carries no risk for Canadian dentists?

False: If a Canadian dentist uses a device that does not comply with Canada's Medical Devices Regulations, this may be a factor in any subsequent liability investigation.

If you answered false to both of the above questions, well done, you've obviously done your homework. But if you answered true to either of them, read on, you may be in for a surprise.

In Canada, unless a material or device is listed under Part V of the Medical Devices Regulations, there is no authority or mechanism under the Food and Drugs Act for the government to approve a medical device or material prior to its sale in Canada.¹ The responsibility for ensuring that a product meets the regulatory requirements actually lies with the manufacturer. And "provided the manufacturer can demonstrate on request that a device is

safe, effective and adequately labelled,"¹ and the Medical Devices Bureau is notified, he or she is free to market the product in Canada.

In fact, the process of notification is a little more complicated than it sounds. It requires the manufacturer of a new device or material to provide Medical Devices Bureau with specific information about the product, including a copy of the directions on how to use the device; a statement explaining the recommended purpose of the device; and, if the device is sterile, a statement describing the method of initial sterilization, as well as the method recommended for the re-sterilization of the device.

The submission must also include the device's model designation, the name and address of its manufacturer or importer, the name and address of its Canadian distributors, the name and address of each drug present in the device, as well as the name and the address of the manufacturer of that drug, and the date when the device was first sold in Canada (notification must occur within 10 days of the date of first sale).

More importantly, prior to marketing a device in Canada, the manufacturer is required to have readily-available test data on file to demonstrate the benefits and performance characteristics of that device.

Most of the devices and materials used in dentistry today — including amalgam and other restorative agents — fall into the

notifiable category. The exceptions to the rule are dental implants and bone dust, both of which are covered by Part V of the Medical Devices Regulations, and can only be legally marketed in Canada if the manufacturer has obtained a notice of compliance from Health Protection Branch.

Unfortunately, some manufacturers still manage to circumvent the rules. A case in point is the Vitek temporomandibular joint interpositional implant. Although it was never granted a notice of compliance by Health Protection Branch, in the 1980s the device was marketed in Canada by a Quebec-based distributor, and was also sold directly to Canadian dentists by the manufacturer. Several Canadian patients subsequently received a Vitek implant.

Problems began to surface in the late 1980s. In 1990 the manufacturer issued a voluntary safety alert warning dentists that: "Vitek's interpositional implant may fragment, delaminate, or otherwise be fractured or punctured. Debris in the joint from alloplastic implants can contribute to progressive bone degenerative changes and to giant cell creation."²

The alert was followed by a product recall, which encouraged Canadian dentists to return any unused Vitek implants to the point of purchase. But it was already too late. In 1994, five Canadian patients, all suffering severe medical complications as a result of having received a Vitek implant, announced their plans to sue the Canadian government and eight oral surgeons.

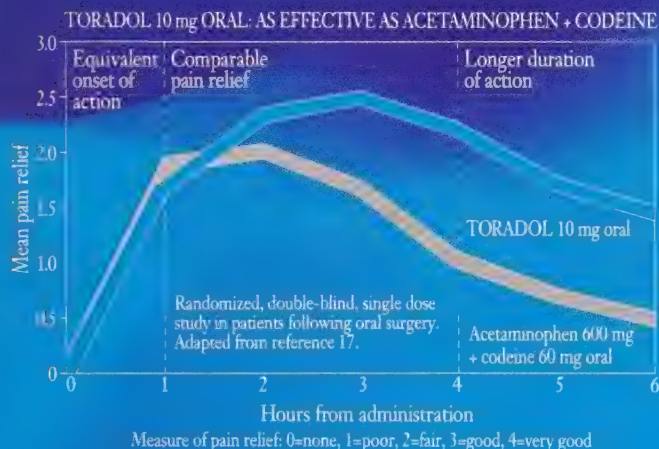
TORADOL

Providing highly effective relief in acute dental pain.



Current strategies in acute pain management suggest a non-narcotic analgesic should be used first, before a narcotic is considered.³⁰

Toradol (ketorolac tromethamine) oral has been proven effective in acute post-dental surgical pain such as third molar extraction pain and mandibular pain.^{17,18,62} Toradol may also provide effective relief for your patients suffering from toothache pain and endodontic/periodontic pain.



Unlike narcotics which work at the CNS, Toradol works peripherally, at the site of the pain,^{2,5,18} and therefore has a lower incidence of nausea, dizziness, drowsiness and constipation.^{17,18,21,22} The lower CNS side effects may be of particular benefit to patients who need to drive, operate machinery and remain alert or active.

By class, Toradol belongs to the non-steroidal anti-inflammatory drug (NSAID) family. However, unlike conventional NSAIDs, it is a potent analgesic agent with minimal anti-inflammatory and antipyretic activity. As with all NSAIDs, the most common side effects with Toradol involve the G.I. tract.

With proven efficacy and patient tolerability, Toradol oral is a logical first choice in the short-term management of acute dental pain.

TORADOL
10 mg tablets & 30 mg/mL IM injections KETOROLAC TROMETHAMINE

Effectively treating acute pain

Treatment not to exceed 7 days for musculoskeletal pain. Post-surgical patients not to exceed 5 days.



TORADOL®

10 mg tablets & 30 mg/mL IM injections KETOROLAC TROMETHAMINE

Effectively treating acute pain

TORADOL® (ketorolac tromethamine) 10 mg tablets
TORADOL® IM (ketorolac tromethamine injection) 10 mg/mL or 30 mg/mL intramuscular injection
THERAPEUTIC CLASSIFICATION NSAID Analgesic Agent

ACTION

Toradol (ketorolac tromethamine) is a non-steroidal anti-inflammatory drug (NSAID) that exhibits analgesic activity mediated by peripheral effects. Ketorolac inhibits the synthesis of prostaglandins through inhibition of the cyclo-oxygenase enzyme system. At analgesic doses, it has minimal anti-inflammatory and antipyretic activity. Pain relief is comparable following the administration of ketorolac by intramuscular or oral routes. The peak analgesic effect occurs at 2-3 hours post-dosing with no evidence of a statistically significant difference over the recommended dosage range. The greatest difference between large and small doses of Toradol administered by either route is in the duration of analgesia. Ketorolac tromethamine is rapidly and completely absorbed when administered by either the oral or the intramuscular route. The pharmacokinetics are linear following single and multiple dosing. Steady state plasma levels are attained after one day of Q.I.D. dosing. Following oral administration, peak plasma concentrations of 0.7 to 1.1 µg/mL occur at an average of 44 minutes after a single 10 mg dose. The terminal plasma elimination half-life ranges between 2.4 and 9.0 hours in healthy adults, and between 4.3 and 7.6 hours in elderly subjects (mean age 72 yrs). A high fat meal decreases the rate, but not the extent, of absorption of oral ketorolac tromethamine. The use of an antacid has not been demonstrated to affect the pharmacokinetics of ketorolac. Following intramuscular administration, peak plasma concentrations of 2.2 to 3.0 µg/mL occur at an average of 50 minutes after a single 30 mg dose. The terminal plasma half-life ranges between 3.5 and 9.2 hours in young adults and between 4.7 and 8.6 hours in elderly subjects (mean age = 72 years). In renally impaired patients there is a reduction in clearance and an increase in the terminal half-life of ketorolac tromethamine (see table below). The primary route of excretion of ketorolac tromethamine and its metabolites (conjugates and the p-hydroxy metabolite) is in the urine (91.4%) with the remainder (6.1%) being excreted in the feces. More than 99% of the ketorolac in plasma is protein bound over a wide concentration range. The parenteral administration of Toradol has not been demonstrated to affect the hemodynamics of anaesthetized patients.

THE INFLUENCE OF AGE, LIVER AND KIDNEY FUNCTION ON THE CLEARANCE AND TERMINAL HALF-LIFE OF TORADOL IM¹ AND ORAL²

TYPES OF SUBJECTS	TOTAL CLEARANCE (in L/h/kg)		TERMINAL HALF-LIFE (in hours)	
	IM MEAN (range)	ORAL MEAN (range)	IM MEAN (range)	ORAL MEAN (range)
Normal Subjects IM (n=54) Oral (n=77)	0.023 (0.010-0.046)	0.025 (0.013-0.050)	5.3 (3.5-9.2)	5.3 (2.4-9.0)
Healthy Elderly Subjects IM (n=13), Oral (n=12) (mean age = 72, range = 65-78)	0.019 (0.013-0.034)	0.024 (0.018-0.034)	7.0 (4.7-8.6)	6.1 (4.3-7.6)
Patients with Hepatic Dysfunction IM and Oral (n=7)	0.029 (0.013-0.066)	0.033 (0.019-0.051)	5.4 (2.2-6.9)	4.5 (1.6-7.6)
Patients with Renal Impairment IM and Oral (n=9)(serum creatinine 1.9 - 5.0 mg/dL)	0.014 (0.007-0.043)	0.016 (0.007-0.052)	10.3 (8.1-15.7)	10.8 (3.4-18.9)
Renal Dialysis Patients IM (n=9)	0.016 (0.003-0.036)		13.6 (8.0-39.1)	

¹ Estimated from 30 mg single IM doses of ketorolac tromethamine

² Estimated from 10 mg single oral doses of ketorolac tromethamine
 3 Litres/hour/kilogram

INDICATIONS

Oral Route: Orally administered Toradol (ketorolac tromethamine) is indicated for the short-term management (not to exceed 5 days for post-surgical patients or 7 days for patients with musculoskeletal pain) of moderate to moderately severe acute pain, including post-surgical pain (such as general, orthopaedic and dental surgery), acute musculoskeletal trauma pain and post-partum uterine cramping pain. (See WARNINGS and DOSAGE AND ADMINISTRATION)

Intramuscular Route: Intramuscular injection of Toradol is indicated for the short-term management (not to exceed 2 days) of moderate to severe acute pain, including pain following major abdominal, orthopaedic and gynecological operative procedures. The total duration of combined intramuscular and oral treatment should not exceed 5 days.

CONTRAINDICATIONS

Hypersensitivity: Like other non-steroidal anti-inflammatory drugs, Toradol (ketorolac tromethamine) has been associated with hypersensitivity reactions. Toradol should not be used when there is a known or suspected hypersensitivity to the drug and should be discontinued in patients who develop symptoms of hypersensitivity during therapy. Because of the possibility of cross-sensitivity, Toradol should not be used in patients with the complete or partial syndrome of nasal polyps, angioedema, bronchospastic reactivity (e.g. asthma) or other allergic manifestations to acetylsalicylic acid (ASA) or other non-steroidal anti-inflammatory drugs. Severe and fatal anaphylactoid reactions have occurred in such individuals.

Gastrointestinal: Toradol should not be used in patients with suspected or confirmed peptic ulcer disease, gastrointestinal bleeding or perforation, or active inflammatory disease of the gastrointestinal system or in patients who have a history of these disorders. Severe and fatal reactions have occurred in such individuals.

Renal Impairment: Toradol is contraindicated in patients with moderate to severe renal impairment or in patients at risk for renal failure due to volume depletion.

Haemorrhagic Risk: Toradol is contraindicated immediately before any major surgery, and is contraindicated intraoperatively when hemostasis is critical because of the increased risk of bleeding. Toradol is also contraindicated in patients with coagulation disorders, postoperative patients with high haemorrhagic risk or incomplete haemostasis, and in patients with suspected or confirmed cerebrovascular bleeding.

Obstetrics: Toradol is contraindicated in labour and delivery because, through its prostaglandin synthesis inhibitory effect, it may adversely affect fetal circulation and inhibit uterine musculature, thus increasing the risk of uterine hemorrhage.

Neuraxial Administration: Toradol IM is contraindicated for neuraxial (epidural or intrathecal) administration due to its alcohol content.

Concomitant Medications: Toradol is contraindicated in patients currently receiving ASA or NSAIDs because of the cumulative risks of inducing serious NSAID-related adverse events. The concomitant use of Toradol and probenecid is also contraindicated.

WARNINGS

The long-term administration of Toradol (ketorolac tromethamine) is not recommended as the incidence of side-effects increases with the duration of treatment (see INDICATIONS and DOSAGE AND ADMINISTRATION). The most serious risks associated with NSAIDs including Toradol are:

Gastrointestinal Ulcerations, Bleeding and Perforation: Serious gastrointestinal toxicity, such as bleeding, ulceration, and perforation, can occur at any time, with or without warning symptoms, during therapy with non-steroidal anti-inflammatory drugs. The incidence of gastrointestinal complications increases with dosage and duration of treatment. Elderly and debilitated patients are more susceptible to these complications. To date, studies with NSAIDs have not identified any subset of patients not at risk for developing peptic ulceration and bleeding. Post-marketing experience with Toradol suggests that there may be a greater risk of gastrointestinal ulcerations, bleeding, and perforation in the elderly, and most spontaneous reports of fatal gastrointestinal events are in the aged population.

THE LONG-TERM USE OF TORADOL IS NOT RECOMMENDED.

Renal Toxicity: The following renal abnormalities have been associated with Toradol and other drugs that inhibit renal prostaglandin biosynthesis: acute renal failure, nephrotic syndrome, interstitial nephritis, renal papillary necrosis. Elevations of blood urea nitrogen (BUN) and creatinine have been reported in clinical trials with ketorolac tromethamine. Toradol is contraindicated in patients with moderate to severe renal impairment. Hypovolemia should be corrected before treatment with Toradol is initiated. Patients who are volume depleted may be dependent on renal prostaglandin production to maintain renal perfusion and, therefore, glomerular filtration rate. In such patients, the use of drugs which inhibit prostaglandin synthesis has been associated with further decreases in renal blood flow and may precipitate acute renal failure. Predisposing factors include dehydration (e.g. as a result of extreme exercise, vomiting or diarrhea associated with the loss of at least 5 to 10% of total body weight, unrelieved blood loss of approximately 500 mL), sepsis, impaired renal function, heart failure, liver dysfunction, diuretic therapy, and advanced age. Caution is advised if ketorolac tromethamine is used in such circumstances. Close monitoring of urine output, serum urea and serum creatinine is recommended until renal function recovers.

Fluid Retention and Edema: Fluid retention, edema, NaCl retention, oliguria, elevations of serum urea nitrogen and creatinine have been observed in patients treated with Toradol. Therefore, the possibility of precipitating congestive heart failure in elderly patients or those with compromised cardiac function should be considered. Toradol should be used with caution in patients with cardiac decompensation, hypertension or other conditions which cause a predisposition to fluid retention.

Haemorrhage: Postoperative haematomas and other symptoms of wound bleeding have been reported in association with the perioperative use of intramuscular Toradol. Toradol is contraindicated in patients who have coagulation disorders. If Toradol is to be administered to patients who are receiving drug therapy that interferes with haemostasis, careful observation is advised. Use of Toradol in patients who are receiving therapy that affects hemostasis should be undertaken with caution, including close monitoring. The concurrent use of Toradol and prophylactic, low dose heparin (2500-5000 units q12h), warfarin and dextran may also be associated with an increased risk of bleeding (see DRUG INTERACTIONS). In patients receiving anticoagulants, the risk of intramuscular haematoma formation from Toradol IM injections is increased.

Hypersensitivity Reactions: The possibility of severe or fatal hypersensitivity reactions should be considered, even for patients with no known history of previous exposure or hypersensitivity to Toradol or other NSAIDs. Counteractive measures must be available when administering the first dose of Toradol IM. As with other NSAIDs, patients should be questioned for history of allergy to NSAIDs or ASA or for the syndrome consisting of nasal polyps, ASA allergy and asthma before being prescribed Toradol. Asthmatic patients with triad asthma (the syndrome of nasal polyps, asthma and hypersensitivity to ASA or other NSAIDs) may be at particular risk for severe hypersensitivity reactions.

Use in Pregnancy and Lactation: The administration of ketorolac tromethamine is not recommended during pregnancy or lactation. After 1 day at 10 mg q.i.d. oral dosing, Toradol has been detected in the milk of lactating women at a maximum concentration of 7.9 ng/mL.

Use in Children: Safety and efficacy in children have not been established. Therefore, Toradol is not recommended for use in children under age 16.

Use in the Elderly: Because ketorolac is cleared somewhat more slowly by the elderly (See PHARMACOKINETICS) who are also more sensitive to the gastrointestinal and renal effects of NSAIDs, (See WARNINGS and PRECAUTIONS) extra caution and the lowest effective dose (See DOSAGE AND ADMINISTRATION) should be used.

PRECAUTIONS

Physicians should be alert to the pharmacologic similarity of Toradol (ketorolac tromethamine) to other non-steroidal anti-inflammatory drugs that inhibit cyclo-oxygenase.

Gastrointestinal Effects: Close medical supervision is recommended in patients prone to gastrointestinal tract irritation. In these cases, the physician must weigh the benefits of treatment against the possible hazards. Patients taking any NSAID including ketorolac tromethamine should be instructed to contact a physician immediately if they experience symptoms or signs suggestive of peptic ulceration or gastrointestinal bleeding. These reactions can occur at any time during the treatment. If peptic ulceration is suspected or confirmed, or if gastrointestinal bleeding occurs, ketorolac tromethamine should be discontinued and appropriate treatment instituted with close patient monitoring.

Hepatic Effects: Caution should be observed if Toradol is to be used in patients with impaired hepatic function, or a history of liver disease. Treatment with Toradol may cause elevations of liver enzymes, and in patients with pre-existing liver dysfunction, it may lead to the development of a more severe hepatic reaction. Meaningful elevations (greater than 3 times normal) of serum transaminases (glutamate pyruvate [SGPT or ALT] and glutamic oxaloacetic [SGOT or AST], occurred in controlled clinical trials in less than 1% of patients. If clinical signs and symptoms consistent with liver disease develop, or if systemic manifestations occur (e.g., eosinophilia, rash, etc.), ketorolac tromethamine should be discontinued. Patients with impaired hepatic function from cirrhosis do not have any clinically important changes in ketorolac tromethamine clearance. Studies in patients with active hepatitis or cholestasis have not been performed.

Hematologic Effects: Ketorolac tromethamine inhibits platelet function and may prolong bleeding time. It does not affect platelet count, prothrombin time (PT) or partial thromboplastin time (PTT). Unlike the prolonged effects from ASA the inhibition of platelet function by ketorolac tromethamine is normalized within 24 to 48 hours after the drug is discontinued. Blood dyscrasias associated with the use of NSAIDs are rare, but could occur with severe consequences.

Infection: In common with other non-steroidal anti-inflammatory drugs, ketorolac tromethamine may mask the usual signs of infection.

DRUG INTERACTIONS

Protein Binding: Toradol (ketorolac tromethamine) is highly bound to human plasma protein (mean 99.2%) and binding is independent of concentration. As ketorolac tromethamine is a highly potent drug and present in low concentrations in plasma, it would not be expected to displace other protein-bound drugs significantly. Therapeutic concentrations of digoxin, warfarin, acetaminophen, phenytoin, and tolbutamide did not alter ketorolac tromethamine protein binding.

Anticoagulant Therapy: Prothrombin time should be carefully monitored in all patients receiving oral anticoagulant therapy concomitantly with ketorolac tromethamine. Toradol IM given with two doses of 5000 U of heparin to 11 healthy volunteers, resulted in a mean template bleeding time of 6.4 min (3.2-11.4 min) compared to a mean of 6.0 min (3.4-7.5 min) for heparin alone and 5.1 min (3.5-8.5 min) for placebo. The *in vitro* binding of warfarin to plasma proteins is only slightly reduced by ketorolac tromethamine (99.5% control vs. 99.3%) at plasma concentrations of 5 to 10 µg/mL.

Digoxin: Ketorolac tromethamine does not alter digoxin protein binding.

Salicylates: *In vitro* studies indicated that, at therapeutic concentrations of salicylates (300 µg/mL), the binding of ketorolac tromethamine was reduced from approximately 99.2% to 97.5% representing a potential two-fold increase in unbound Toradol plasma levels.

Enzyme Induction: There is no evidence, in animal or human studies, that ketorolac tromethamine induces or inhibits the hepatic enzymes capable of metabolizing itself or other drugs. Hence, it would not be expected to alter the pharmacokinetics of other drugs due to enzyme induction or inhibition mechanisms.

Probenecid: Concomitant administration of ketorolac tromethamine and probenecid results in the decreased clearance of ketorolac and a significant increase in ketorolac plasma levels (approximately three-fold increase) and terminal half-life (approximately two-fold increase). The concomitant use of Toradol and probenecid is, therefore, contraindicated.

Furosemide: Ketorolac tromethamine reduces the diuretic response to furosemide by approximately 20% in normovolemic subjects.

Lithium: Some NSAIDs have been reported to inhibit renal lithium clearance, leading to an increase in plasma lithium concentrations and potential lithium toxicity. The effect of ketorolac tromethamine on lithium plasma levels has not been studied.

Methotrexate: The concomitant administration of methotrexate and some NSAIDs has been reported to reduce the clearance of methotrexate, thus enhancing its toxicity. The effect of ketorolac tromethamine on methotrexate clearance has not been studied.

ACE Inhibitors: Concomitant use of ACE inhibitors and other NSAIDs may increase the risk of renal impairment, particularly in volume depleted patients.

Morphine: Intramuscular Toradol has been administered concurrently with morphine in several clinical trials of postoperative pain without evidence of adverse interactions.

ADVERSE EVENTS

TORADOL TABLETS

Short-Term Patient Studies

The incidence of adverse reactions in 371 patients receiving multiple 10 mg doses of Toradol (ketorolac tromethamine) for pain resulting from surgery or dental extraction during the post operative period (less than 2 weeks) is listed below. These reactions may or may not be drug related.

Incidence Between 4 and 9%: Nervous System: Somnolence, insomnia. **Digestive System:** Nausea. **Incidence Between 2 and 3%: Nervous System:** Nervousness, headache, dizziness. **Digestive System:** Diarrhea, dyspepsia, gastrointestinal pain, constipation. **Body As A Whole:** Fever. **Incidence 1% or Less: Nervous System:** Abnormal dreams, anxiety, dry mouth, hyperkinesia, paresthesia, increased sweating, euphoria, hallucinations. **Digestive System:** Anorexia, flatulence, vomiting, stomatitis, gastritis, gastrointestinal disorder, sore throat. **Body As A Whole:** Asthenia, pain, back pain. **Cardiovascular System:** Vasodilatation, palpitation, migraine, hypertension. **Respiratory System:** Cough increased, rhinitis, dry nose. **Musculo-skeletal System:** Myalgia, arthralgia. **Skin & Appendages:** Rash, urticaria. **Special Senses:** Blurred vision, ear pain. **Urogenital System:** Dysuria.

Long-Term Patient Study

The adverse reactions listed below were reported to be probably related to study drug in 553 patients receiving long-term oral therapy (approximately 1 year) with Toradol.

Incidence Between 10 and 12%: Digestive System: Dyspepsia, gastrointestinal pain. **Incidence Between 4 and 9%: Digestive System:** Nausea, constipation. **Nervous System:** Headache. **Incidence Between 2 and 3%: Digestive System:** Diarrhea, flatulence, gastrointestinal fullness, peptic ulcers. **Nervous System:** Dizziness, somnolence. **Metabolic/Nutritional Disorder:** Edema. **Incidence 1% or Less: Digestive System:** Eructation, stomatitis, vomiting, anorexia, duodenal ulcer, gastritis, gastrointestinal haemorrhage, increased appetite, melena, mouth ulceration, rectal bleeding, sore mouth. **Nervous System:** Abnormal dreams, anxiety, depression, dry mouth, insomnia, nervousness, paresthesia. **Special Senses:** Tinnitus, taste perversion, abnormal vision, blurred vision, deafness, lacrimation disorder. **Metabolic/Nutritional Disorder:** Weight gain, alkaline phosphatase increase, BUN increased, excessive thirst, generalized edema, hyperuricemia. **Skin & Appendages:** Pruritus, rash, burning sensation skin. **Body as a Whole:** Asthenia, pain, back pain, face edema, hernia. **Musculo-skeletal System:** Arthralgia, myalgia, joint disorder. **Cardiovascular System:** Chest pain, chest pain substernal, migraine. **Respiratory System:** Dyspnea, asthma, epistaxis. **Urogenital System:** Hematuria, increased urinary frequency, oliguria, polyuria. **Hemic & Lymphatic** Anemia, purpura.

TORADOL IM

The adverse reactions listed below were reported in Toradol IM clinical efficacy trials. In these trials patients (N=660) received either single 30 mg doses (N=151) or multiple 30 mg doses (N=509) over a time period of 5 days or less for pain resulting from surgery. These reactions may or may not be drug related.

Incidence Between 10 and 13%: Nervous System: Somnolence. **Digestive System:** Nausea. **Incidence Between 4 and 9%: Nervous System:** Headache. **Digestive System:** Vomiting. **Injection Site:** Injection site pain. **Incidence Between 2 and 3%: Nervous System:** Sweating, dizziness. **Cardiovascular System:** Vasodilatation.

Incidence 1% or Less: Nervous system: Insomnia, increased dry mouth, abnormal dreams, anxiety, depression, paresthesia, nervousness, paranoid reaction, speech disorder, euphoria, libido increased, excessive thirst, inability to concentrate, stimulation. **Digestive system:** Flatulence, anorexia, constipation, diarrhea, dyspepsia, gastrointestinal fullness, gastrointestinal haemorrhage, gastrointestinal pain, melena, sore throat, liver function abnormalities, rectal bleeding, stomatitis. **Cardiovascular system:** Hypertension, chest pain, tachycardia, haemorrhage, palpitation, pulmonary embolus, syncope, ventricular tachycardia, pallor, flushing. **Injection site:** Injection site reaction. **Body as a Whole:** Asthenia, fever, back pain, chills, pain, neck pain. **Special senses:** Taste perversion, tinnitus, blurred vision, diplopia, retinal haemorrhage. **Musculo-skeletal system:** Myalgia, twitching. **Respiratory system:** Asthma, cough increased, dyspnea, epistaxis, hiccup, rhinitis. **Skin and appendages:** pruritus, rash, subcutaneous hematoma, skin disorder. **Urogenital system:** Dysuria, urinary retention, oliguria, increased urinary frequency, vaginitis. **Metabolic/nutritional disorders:** edema, hypokalemia, hypovolemia. **Hemic and lymphatic system:** Anemia, coagulation disorder, purpura.

Postmarketing Experience

The following postmarketing adverse experiences have been reported for patients who have received either formulation of Toradol: **Renal Events:** Acute renal failure, flank pain with or without haematuria and/or azotemia, nephritis, hyponatremia, hyperkalemia, hemolytic uremic syndrome, urinary retention. **Hypersensitivity reactions:** Bronchospasm, laryngeal edema, asthma, hypotension, flushing, rash, anaphylaxis, and anaphylactoid reactions. Such reactions have occurred in patients with no prior history of hypersensitivity. **Gastrointestinal Events:** Gastrointestinal hemorrhage, peptic ulceration, gastrointestinal perforation, pancreatitis, melena. **Hematologic Events:** Postoperative wound haemorrhage, rarely requiring blood transfusion (see PRECAUTIONS), thrombocytopenia, epistaxis, leukopenia. **Central Nervous System:** Convulsions, abnormal dreams, hallucinations, hyperkinesia, hearing loss, aseptic meningitis, extrapyramidal symptoms. **Hepatic Events:** Hepatitis, liver failure, cholestatic jaundice. **Cardiovascular:** Pulmonary edema, hypotension, flushing. **Dermatology:** Lyell's syndrome, Stevens-Johnson syndrome, exfoliative dermatitis, maculopapular rash, urticaria. **Body as Whole:** infection.

OVERDOSAGE

In a gastroscopic study of healthy subjects, daily doses of 360 mg given over an 8-hour interval for each of five consecutive days (3 times the highest recommended dose) caused pain and peptic ulcers which resolved after discontinuation of dosing. Metabolic acidosis has been reported following intentional overdosage. Single oral doses of 200 mg have been administered to patients with no apparent serious side effects. Dialysis does not appreciably clear ketorolac from the blood stream.

DOSAGE AND ADMINISTRATION

Adults: Dosage should be adjusted according to the severity of the pain and the response of the patient. **Oral:** The usual oral dose of Toradol (ketorolac tromethamine) is 10 mg every 4 to 6 hours for pain as required. Doses exceeding 40 mg per day are not recommended. The maximum duration of treatment with the oral formulation is 5 days for post-surgical patients and 7 days for patients with musculoskeletal pain.

Intramuscular: The recommended usual initial dose is 10-30 mg, according to pain severity. Subsequent dosing may be 10 mg to 30 mg every 4-6 hours as needed to control pain. The lowest effective dose should be administered. The administration of Toradol IM should be limited to short-term therapy (not over 2 days). The total daily dose should not exceed 120 mg because the risk of toxicity appears to increase with longer use at recommended doses (see WARNINGS and PRECAUTIONS). The administration of continuous multiple daily doses of Toradol IM has not been extensively studied. There has been limited experience with intramuscular dosing for more than 3 days since the vast majority of patients have transferred to oral medication or no longer required analgesic therapy after this time.

If supplementary analgesia is required, a concomitant low dose of opiate can be used.

Patients Under 50 kg, Over Age 65 Years, or With Less Severe Pain at Baseline:

Oral: The lowest effective dose is recommended.

Parenteral: The lower end of the dosage range is recommended. The initial dose should be 10 mg. The total daily dose of Toradol IM in the elderly should not exceed 60 mg.

Impaired Renal Function:

Toradol is not recommended for patients with moderate to severe renal impairment.

Conversion from Parenteral to Oral Therapy:

Toradol tablets may be used either as monotherapy or as follow-on therapy to parenteral ketorolac. When Toradol tablets are used as a follow-on therapy to parenteral ketorolac, the total combined daily dose of ketorolac (oral + parenteral) should not exceed 120 mg in younger adult patients or 60 mg in elderly patients on the day the change of formulation is made. On subsequent days, oral dosing should not exceed the recommended daily maximum of 40 mg. Toradol IM should be replaced by an oral analgesic as soon as feasible. The total duration of combined intramuscular and oral treatment should not exceed 5 days. Parenteral drug products should be inspected visually for particulate material and discoloration prior to use.

Toradol (ketorolac tromethamine) is a Schedule F drug.

Stability and Storage Recommendations

Toradol Tablets: Store at room temperature with protection from light.

Toradol IM: Store at room temperature with protection from light.

Availability of Dosage Forms

Toradol (ketorolac tromethamine) is available as 10 mg white round film coated tablets with one side printed in red with TORADOL inside bold T and other side with Syntex. Toradol (ketorolac tromethamine) 10 mg tablets are available in bottles of 100 and 500 tablets.

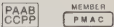
Toradol IM is available in 1 mL ampoules (trays of 10) containing 10 or 30 mg/mL.

Product Monograph available on request.

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Hoffmann-La Roche Limited,
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The implications of the Vitek case for Canadian dentists are aptly described by Dr. W.J.W. Freeland, the chief of MDB's device evaluation division, who said: "If you're using non-compliant items, you may be making yourself additionally liable."

Another area of concern for Medical Devices Bureau is infection control. With the increasing popularity of tissue transplants in dentistry, particularly the dried bone cells used in periodontal surgery, and to promote bone regeneration around dental implants, there is growing concern about the transmission of infectious disease. To date, Canada has not implemented comprehensive regulations with respect to testing transplant material for the presence of HIV, HBV and other pathogens, but Health Protection Branch is monitoring the situation, and a consensus conference is planned for later this year to consider possible options.

The problem is particularly worrisome, in that some Canadian dentists are buying bone material directly from the United States, via direct mail. Only a handful of the U.S. manufacturers currently shipping bone material into Canada have obtained a notice of compliance to market their product in Canada, however, and the dentists who use it may be putting both themselves and their patients at risk.

With only 35 inspectors in the field, MDB does not have the manpower to determine if every device or material being marketed in Canada complies with Canadian regulations. Instead, it addresses issues selectively, on a risk basis, and reacts to complaints from manufacturers, professionals, and the public.

Dentists can avoid the risks associated with using non-compliant devices or materials by contacting MDB's electronic bulletin board service. Among other things, the bulletin board provides the trade names of every medical device that has been notified in Canada, as well as the names and addresses of the manufacturers. It also lists the trade names of devices that have received a notice of compliance from Health Protection Branch; medical device recall data

from both Health Canada and the U.S. Food and Drug Administration; as well as recent alerts, information letters, Dear Doctor Letters and urgent messages.

The system is currently being updated to include a problem reporting form that practitioners can use to send information about medical devices problems to MDB on line. Non-computerized CDA members may also be able to access the service in the near future, by contacting the Library.

Dentists can also seek information directly from their suppliers. In fact, the sales representatives or companies who sell devices and materials in Canada should be able to provide dentists with evidence of notification or a copy of a valid notice of compliance on request.

While dental handpieces and many of the other invasive devices used in dentistry are currently notifiable, and do not require a notice of compliance to be marketed in Canada, this could change in the near future due to increasing concern about infectious disease transmission. In addition, new risk-based device guidelines are likely to be introduced in 1996. If this happens, Dr. Freeland anticipates that medical/dental devices will be approved based on four different risk classifications.

MDB, through its post-marketing surveillance division, is also reconsidering the status of dental amalgam. Its goal is to identify a Health Canada position on amalgam, which will be based on a review of current scientific literature, as well as consultation with the stakeholders. It is now anticipated that the position statement will be promulgated this June, and will result in some restrictions on the use of dental amalgam in Canada.³

Even when a new device or material requires a notice of compliance under Part V of the Medical Devices Regulations, MDB does not actually test the product. Instead, it reviews the pre-clinical and clinical evidence provided by the manufacturer, including data from investigations conducted outside Canada. It's not a perfect science. Implant manufacturers, for instance, are only re-

quired to submit two-year clinical data on post-loading viability.

However, the bureau does maintain an active post-marketing surveillance program for medical devices, and regularly conducts investigations in response to user complaints, manufacturer recalls, or concerns arising from its own research. MDB also maintains a toll-free hotline that manufacturers, health-care professionals and members of the public can use to report medical device problems.

In addition, manufacturers are required, under the Medical Devices Regulations, to maintain records of every problem report they receive. During the course of its problem report investigations, MDB routinely asks manufacturers to submit a report on all relevant complaints. The manufacturers must also inform the bureau of any device recalls. This allows the bureau to monitor the corrective actions taken by the manufacturers in all cases where the recall was the result of significant, high-risk problems.

In short, if MDB receives a complaint against a notifiable device or material, it will ask the manufacturer to provide evidence that the product is safe and efficacious. If the company cannot provide this data, or refuses to do so, the bureau can stop the further sale of the product in Canada.

The system may change in 1996, however, when a number of new regulations are scheduled to come into effect. One of the proposed regulations would restrict the importation of devices and materials into Canada that do not comply with Canadian regulations. ■

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FLUORIDE



Fifty Years Of Fluoridation

P. Ralph Crawford, BA, DMD

Fifty years ago last month, on June 20, 1945, fluoridated drinking water began to flow in Brantford, Ontario, starting a trend that would bring controversy, consternation and, ultimately, improved oral health to millions of Canadians.

It was an inauspicious beginning. Brantford was only the second city in the world — after Grand Rapids, Michigan, in January 1945 — to add fluoride to its public water supply.

In fact, the fluoride concentration used in both Brantford and Grand Rapids — one part of fluoride to one million parts of water — was based on a half century of investigation and research in Canada and the United States. These initial studies were followed by another half century of investigation and research, as well as considerable controversy. But no single event has had more influence on arresting dental caries and improving oral health than the simple addition of 1.0 ppm of sodium fluoride to drinking water.

From the oral health perspective, fluoride first became an issue in 1901, when two American observers, coincidentally and independently, were among the first to report on a peculiar dental deformity and discoloration. Physician John Eager noticed the anomaly in Europe, when he was examining U.S.-bound Italian emigrants from the Naples area. Dr.

Frederick McKay, a 1900 graduate from Pennsylvania Dental School, observed the same deformities in the U.S., when he established a practice in Colorado Springs.

Although he saw the deformity among the first patients he treated in Colorado, it took several lonely years of investigation before Dr. McKay was able to persuade the Colorado Dental Association to invite Chicago's eminent Dr. G.V. Black to attend its state meeting. It was Dr. Black who named the deformity, "mottled enamel." He and Dr. McKay reported their findings in the celebrated article, "An Endemic Developmental Imperfection of the Enamel of the Teeth Heretofore Unknown in the Literature of Dentistry," published in *Dental Cosmos* in February 1916.

Dr. McKay, convinced that there was something in the Colorado Springs water that not only mottled enamel, but also made teeth resistant to decay, continued his research. He eventually found the answer in Bauxite, Arkansas, a company town owned by the Aluminum Company of America (Alcoa).

The teeth of Bauxite's children showed the same brown stain that Dr. McKay had first seen in Colorado, but the teeth of children in a neighboring community were free from mottling. Urged on by Dr. McKay, Alcoa's chemists tested Bauxite's drinking water, and dis-

covered that it contained high levels of naturally occurring fluoride.

This discovery led to a major research effort by the U.S. Public Health Service's new National Institute of Health (NIH). In fact, it was Dr. H. Trendley Dean, NIH's first dental officer, who gave the condition its modern name, "fluorosis," and identified the link between fluoride and a reduction in dental caries. He reported that children in cities with fluoride-free water had three times as many caries as those living in cities with more than 1.0 ppm of fluoride in the water supply.

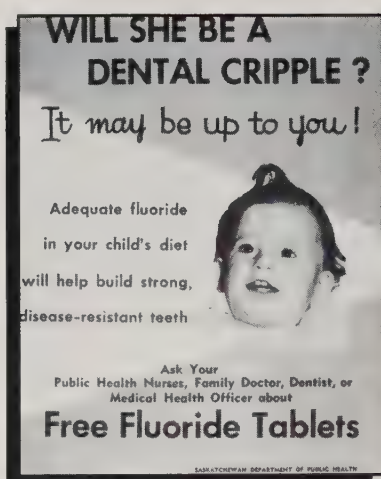
On January 25, 1945, Grand Rapids, Michigan, became the first city in the world to deliberately introduce fluoride into its water supply. The introduction was part of a carefully planned study, with nearby Muskegon to act as the non-fluoridated control community.

Concomitant with the Grand Rapids investigations in the United States, Dr. W.L. Hutton, medical officer of health for the Brant County Health Unit, took up the cause of fluoridation in Canada. Like the American effort, the introduction of fluoride to the Brantford water supply would be part of a larger investigation.

A pre-fluoridation survey of the primary school population had been carried out by the Brantford school dentist, Dr. B. Linscott, before fluoridated water began to

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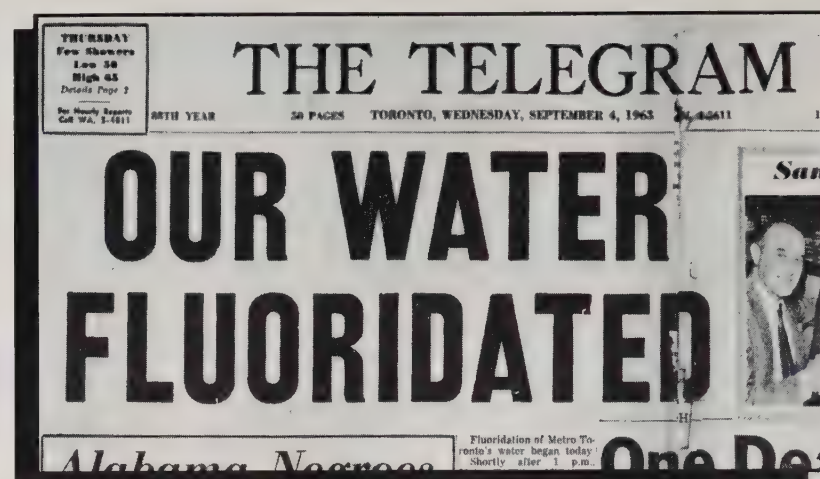
Saskatchewan Department of Public Health poster, late 1950s.

flow in June 1945. Within a year of fluoridation, Brantford health authorities held discussions with the University of Toronto's dental faculty and the National Research Council of Canada's committee on dental research to undertake a controlled study of the effects of fluoridation. Two comparable western Ontario cities, Sarnia and Stratford, agreed to serve as controls — Stratford's water was naturally fluoridated at a concentration of from 1.3 to 1.6 ppm, while Sarnia's water supply was virtually fluoride free.

Within 10 years, the statistics were self-evident. Fluoridated Brantford had a DMF rate that was 50 per cent lower than the rate seen in fluoride-deficient Sarnia, but comparable to the DMF rate for naturally-fluoridated Stratford. A dramatic 1962 Department of National Health and Welfare report stated that children in Brantford and Stratford were 16 times more likely to have caries-free permanent teeth than children in Sarnia.

By January 1962, 8.4 per cent of Canadians lived in communities with controlled fluoridation — representing 1.5 million people in 87 cities, towns and villages. But the introduction of fluoride to community water supplies was still controversial. Of the 37 fluoridation plebiscites held in 1961, only 15 were successful.

Much of the credit for the ongoing success of controlled fluoridation in those "early" days must



Toronto Telegram headline, September 4, 1963.

be given to the Health League of Canada. Under its general director, Dr. Gordon Bates, the league coordinated a concentrated program of educational information, and enlisted the support of Canadian health associations, universities, government departments and concerned social agencies.

No fluoride controversy in Canada drew more attention or press coverage than the eight year "debate" that galvanized the city of Toronto. Although the Toronto metro council passed a fluoride bylaw in 1955, it took a Supreme Court ruling, numerous legislative battles, pages and pages of print, and hours of community debate before a December 1962 referendum carried the day by the slimmest of margins — the vote was 51.7 per cent in favor of fluoridation.

The fluoridation movement's success in Toronto was a personal achievement for Lloyd Bowen — often called the "Father of Fluoride" in Canada. Starting in 1959, Mr. Bowen spent more than seven years as executive secretary of the Health League of Canada's national fluoridation committee, and 17 more years as fluoridation officer for the Canadian Dental Association. During that time, he conducted eight national surveys on the status of fluoridation in Canada, and was largely responsible for the steady growth that occurred in the number of fluoridated communities.



A 1957 magazine advertisement.

By 1986, nearly 40 per cent of the Canadian population was on fluoridated water, ranging from highs of 74 per cent in Manitoba and 65 per cent for Ontario, to lows of eight per cent in Newfoundland and 11.6 for British Columbia. In 1986, 10 out of the 17 Canadian cities with populations greater than 200,000 supported fluoridation, with Montreal, Vancouver, Quebec City and Calgary being the notable exceptions. After four previously unsuccessful plebiscites, Calgary finally voted "yes" to fluoridation in 1989. Research on fluoride dentifrices, mouth rinses and varnishes followed closely on the heels of fluoridated water supplies. In 1955, the *Journal of the Canadian Dental Association* carried its first article on the effects of a stannous fluoride-containing dentifrice on caries re-

duction in children. By the late 1950s, both Procter and Gamble and Colgate-Palmolive had developed brand-name fluoride toothpastes. Shortly afterward, in 1960, the American Dental Association's council on dental therapeutics authorized Procter and Gamble to use the commercial advertisement: "Crest has been shown to be an effective anti-caries dentifrice that can be of significant value when used in a conscientiously applied program of oral hygiene and regular professional care."

In 1971, when the Canadian Dental Association began its Seal of Recognition program, the first two dentifrices recognized were Crest and Colgate with MFP. Today 29 different toothpastes and gels bear the CDA Seal of Recognition.

Fluoridation was an important issue for CDA from the outset of the Brantford study. The association issued one of its first policy statements on the use of fluoride supplements for the prevention of dental caries in 1963, with the recommendation that when water supplies contain less than 0.7 ppm of fluoride, concentrated fluoride supplements may be used.

As dental scientists pursue ongoing, intensive research, CDA and its sister organizations, the American Dental Association, the World Health Organization and the Fédération Dentaire Internationale, continue to responsibly monitor fluoride's effects. In April 1993, CDA hosted the national "Conference on the Evaluation of Current Recommendations Concerning Fluorides" in Toronto, bringing together leading experts from around the world to debate, discuss and evaluate current information.

CDA subsequently used the information coming out of the conference "to support the use of fluorides in the prevention of dental caries as one of the most successful preventive health measures in the history of health care," and issued new guidelines and recommendations for fluoride supplementation.

From the outset, fluoride has had its opponents — some of whom were well-meaning, some

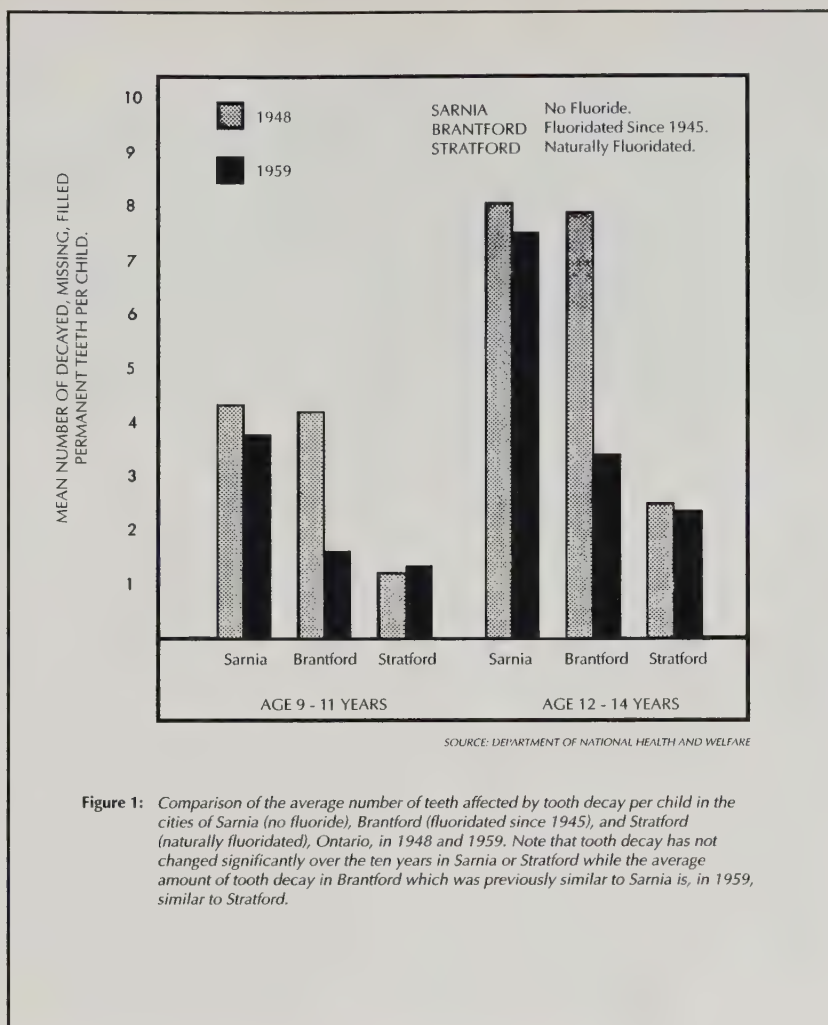


Figure 1: Comparison of the average number of teeth affected by tooth decay per child in the cities of Sarnia (no fluoride), Brantford (fluoridated since 1945), and Stratford (naturally fluoridated), Ontario, in 1948 and 1959. Note that tooth decay has not changed significantly over the ten years in Sarnia or Stratford while the average amount of tooth decay in Brantford which was previously similar to Sarnia is, in 1959, similar to Stratford.

Page from a 1960 brief presented to the Ontario Fluoridation Investigating Committee by the Royal College of Dental Surgeons of Ontario and the Ontario Dental Association.

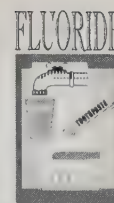
misdirected, and others blatantly erroneous and vicious. In the past few months alone, several pamphlets bearing such provocative headings as: "Dental Fluorosis — A Legal Time Bomb!," "Millions of Dollars Down the Drain!," "Evidence Against Fluoride Continues To Mount," and "Are We Safe or Sorry?" have crossed this author's desk.

The best response to the ongoing opposition to fluoride was probably made in a 1953 editorial by Dr. Wesley Dunn, published in this very journal. Dr. Dunn was responding to an article entitled, "They May Be Risking Your Life," which appeared in the Canadian magazine *New Liberty*:

"The evidence for fluoridation, and the widespread support the measure has received from professional health organizations the world over, make one conjecture

upon the actual reason behind the publishing of such erroneous material in a popular publication," wrote Dr. Dunn. "Unquestionably, articles of a contentious or controversial nature are more likely to be accepted by editorial directors because they appeal to the sensational tastes which many people seem to exhibit in their selection of reading matter. The presence of such material, it is reasoned, cannot help but enhance the sale of the magazine which contains it. When ill-founded speculations of a pseudo-scientific nature are presented, then the possible harm which can accrue to progress in the health field makes the articles deplorable and contrary to the best interests of its readers."

But the opposition to fluoride persists, and it is unclear if fluoridation will continue to be as widespread in the future as it is today.





Fluoride Supplement Dosages For Individuals or Groups at High Risk to Dental Caries, Based on Fluoride Level in Water Supply

Age of Child	Dosage of Daily Supplement	
	Fluoride in water supply < 0.3 ppm (mg/L)	Fluoride in water supply ≥ 0.3 ppm (mg/L)
< 3 years	not recommended	not recommended
3, 4, or 5 years	0.25 mg (0.5 mg if no regular use of fluoridated toothpaste)	not recommended
6 to 13 years	1.0 mg	not recommended

Approved by the Board of Governors, Canadian Dental Association, 1993.

Dr. Hardy Limeback, from the University of Toronto, addresses this question in his article "Toward a Caries-Free Society — Fluoride Therapies for Today and the Next Century," which appears in this issue of the *Journal* (pp. 601-605). The paper presents a summary of what we have learned over the past 50 years, and explains how research and experience have changed some of our concepts of fluoride's anticariogenic effects. But Dr. Limeback leaves no doubt that "water fluoridation is still the most effective, cost-efficient and equitable means of pro-

tecting people against caries. Its safety over the years has been well established. It is the fluoride therapy of choice for the general population. Fluoridated toothpastes, if used by everyone on a daily basis, have proven to be equally as effective. A recommendation that both fluoride therapies be continued, but some adjustment of dosage be considered, is something that will no doubt be debated in years to come."

Fifty years is not a great span of time in the course of human endeavor. However, when we review

the short history of fluoridation — from the early investigations at the turn of the century, the foresight of the city of Brantford in June 1945, the thousands upon thousands of research initiatives by dedicated scientists, and the encouragement of the dental community and a concerned public — we can take justifiable pride. We should all feel proud that our continuing support of the use of fluoride has contributed immeasurably to the well-being and comfort of the public we are dedicated to serve. ■

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Two Conventions Are Better Than One



Throughout the year, a number of dental meetings compete for your attention and attendance. It is quite natural, then, for some of you to ask yourself why you should attend the CDA Convention in Ottawa this August 26 - 29. While you are evaluating your participation, you might want to consider the following:

1 The CDA Annual Convention is the only meeting that attracts dental professionals from across the country.

Those who attend this convention will certainly have the opportunity to meet their peers to discuss concerns and issues affecting dental practices throughout the country. As distinct licencing and regulatory bodies impact differently on the practice of dentistry in each province, it is always highly interesting to exchange information with colleagues to ascertain the laws and fee structure, the economy and treatment plans that affect the evolution of dental care in one's own country.

2 The CDA Convention will help you fulfill the requirements for continuing education credits which have now become mandatory in several provinces. The national meeting offers a wide variety of topics of interest to the general practitioner and the specialist whether he/she is a new graduate or an experienced dental professional. There are over 45 lectures from which to choose during the two pre-convention days (Saturday and Sunday) and the two days of the convention proper (Monday and Tuesday). We will furnish proof of attendance at these lectures.

3 The CDA Convention is a fantastic opportunity for staff members to learn with each other and with their counterparts from across the country. In addition, CDA members who register before July 21st can attend the Convention for FREE and every dentist who pre-registers may register two staff members to the Convention proper for FREE also! What a great opportunity to bring your dental team together to a meeting geared for all dental professionals!

4 The 1995 Convention will launch a newly designed Exhibit Hall layout, a European look never before displayed in a North American dental meeting. Your time spent in the Exhibit Hall is invaluable and your visit will be all the more pleasant with the new layout as you actively seek out new products and services which you may require.

5 The Exhibit Hall will also be the site for a number of draws. Pre-registered participants will have a possibility of winning 2 economy class return tickets to any destination served by Air Canada (some restrictions apply) — a draw you and your team won't want to miss! Also, dentists will be given a ballot to win a Harley Davidson, Sportster 1200! Both these draws will take place in the Exhibit Hall, bring your tickets with you and deposit them in the appropriate ballot box. Ten (10) convention participants will also receive surprise gifts each day the Exhibit is open. At 12:00 noon and 4:00 pm on both Monday and Tuesday, 5 names will be drawn and a gift valued at approximately \$100 each will be awarded to the lucky winner. You'll not know how much fun it is to shop in the exhibit hall until you attend the CDA 1995 Convention!

6 You may also be among the fortunate participants to receive a lunch ticket to be used in the venue next to the Exhibit Hall. These tickets will be given out randomly by our computer system, so keep a watchful eye on your convention kit.

7 The 1995 CDA Convention offers a package of social events and tours unparalleled in other conventions. You may choose to dance the night away to the sounds of the 50's, participate in a perhaps more sophisticated atmosphere at the Wine Tasting Reception or you may opt to attend the Opening Ceremony and the following Meet & Greet evening. Whatever your choice, you will be pleased you decided to participate in the Convention's Social Program. Again, unlike other Canadian dental conventions, a program designed especially for spouses and one especially for children make of the 1995 CDA National Convention an event that can be enjoyed not only by dental team members but by the entire family.

These are just some of the many events and activities you can anticipate at the CDA Convention this August. We trust that if you have not already registered you will call our offices and do so today.

Dr. Elizabeth MacSween, Chair
CDA 1995 Convention
Canadian Dental Association
1815 Alta Vista Drive
Ottawa, Ontario K1G 3Y6

Tel.: 1-800-267-6354
Fax: (613) 523-3062



OTTAWA 1995
August 26 - 29

SOCIAL EVENTS

OPENING CEREMONY

SUNDAY, AUGUST 27 ★ 5:00 PM - 7:00 PM

ASH TEMPLE and CDA CONVENTIONS

invite you to the 1995 Opening Ceremony.

Enjoy two hours of family entertainment in the grand theatre at the
National Arts Centre.

FEATURING the talents of the following Canadian artists:

- ★ Musical Performance Group
- ★ Comedian / Master of Ceremonies — Denis Grignon
- ★ Circus Performers — Cirque Eloize

AND
MORE!

Be sure to request your ticket to the Opening Ceremony on your enrolment form. Tickets are given out on a first-come, first-served basis. There are only 2,000 seats in total and requests are being received daily.

Meet & Greet

SUNDAY, AUGUST 27

7:00 PM - 10:00 PM

Purchase your tickets now for the Meet & Greet event. Following the Opening Ceremony, ticket holders will **proceed to the Panorama Room**, which has an outdoor terrace overhanging the Rideau Canal at the **National Arts Centre**. A great location for the friendly atmosphere of the evening. It'll be a time of renewing old acquaintances and making new friends from across Canada. **Magicians, circus acts, jugglers** and other attractions will entertain while you enjoy a light evening meal in this **carnival atmosphere**. Register today!



SOCIAL EVENTS



OTTAWA 1995
August 26 - 29

GREAT BALLS OF FIRE 🎵 **JAILHOUSE ROCK** 🎵 **ROCK AROUND THE CLOCK**

MONDAY, AUGUST 28

President's Gala — 50's DANCE

The 50's and 60's are here again!

Cocktails — 7:00 p.m. - 8:00 p.m. / **Dinner & Dance** — 8:00 p.m. onward

Featuring: Performances by some of your favourite artists of the era.

Special appearances from some of your favourite artists of the 50's and 60's will take you back to a time we all remember fondly. The music will truly be reminiscent of the era. The dress for the evening will bring back many memories as we dance the evening away in poodle skirts, high school letter sweaters, white t-shirts, bobby socks, greased-back hair and chiffon evening dresses. Great food and dynamic music will highlight the evening.

Purchase your tickets now by selecting the appropriate event on your enrolment form.

LA BAMBA 🎵 **CHANTILLY LACE** 🎵 **ONE FINE DAY** 🎵 **MY BOYFRIEND'S BACK**



**WINE
TASTING**

RECEPTION



TUESDAY, AUGUST 29

7:30 p.m. - 9:30 p.m.

The Ottawa Dental Society invites you to a wine tasting reception at the beautiful National Art Gallery located adjacent to the Rideau River, overlooking the river into Quebec on one side and the Parliament Buildings on the other. Enjoy the best of vintages and spirits from regional vineyards in a relaxing ambiance filled with classical music.

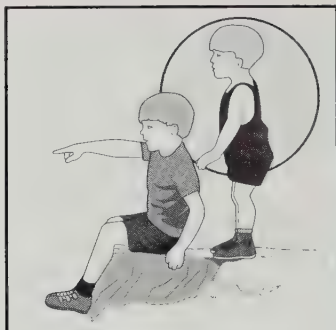
Purchase your tickets in advance by filling out the social events section on your enrolment form.



OTTAWA 1995
August 26 - 29

SOCIAL EVENTS

Children's Program



MONDAY, AUGUST 28 —

Museum of Science & Technology / Wave Pool

The Museum of Science & Technology is filled with exhibits and displays that encourage a hands-on approach to science for children of all ages. Children can board old trains, explore the galaxy, watch baby chicks hatching, participate in EUREKA! the interactive science hall, and much, much more. Lunchtime will be spent at McDonalds then off to the Wave Pool for the afternoon. This supervised indoor pool has timed intermittent waves — great fun for the water lover. As well there are calm periods for those who just like to swim. A fun afternoon for all water types.

TUESDAY, AUGUST 29 —

Museum of Civilization / Surprise Visit

The Museum of Civilization features a lively Children's Museum which takes the children on a guided tour of various civilizations around the globe. This wonderful experience includes dressing up in time period clothing and sampling ethnic foods. Due to the closing of the Log Farm, another similar outing will be offered for the children's program on Tuesday afternoon. Registered participants will be notified of the new location and activities planned for the day.

FUN RUN & WALK

Tuesday, August 29

Come and have fun ... on the run!

Run 5 or 10 kilometers or walk 5 kilometers at your own speed. The 1995 Convention fun run and walk will take participants along the Rideau Canal, one of the most beautiful routes to be found in Ottawa. We will record your time, but most of all we want you to have fun.

To register, fill out the fun run section on your enrolment form.

GOLF TOURNAMENT

The golf tournament at the CDA 1995 Convention is hosted by Aurum Ceramic/Classic and the Dentistry Canada Fund.

This tournament begins at 9:00 a.m. at the Chaudière Golf Club. Every golfer is eligible to qualify for the \$1 million challenge as this tournament will be the grand finale of 18 tournaments held coast to coast this year.

To register, simply check the golf section on your enrolment form and send in the necessary forms.



Visits & One-Day Tours



MONDAY, AUGUST 28 —

Ottawa City Tour and National Gallery of Canada

Board a double-decker bus and begin your excursion with a scenic and historical tour within the city of Ottawa. The tour will start by going around the Byward Market, then along Sussex Drive and through Rockcliffe Park; definitely one of the most scenic drives in the city. Next you'll proceed along Queen Elizabeth Drive as it follows the beautiful Rideau Canal to Dow's Lake. Along this route you'll admire national embassies and heritage homes. Your final destination will be the National Gallery of Canada. Here you'll enjoy a fabulous luncheon then continue on a voyage of discovery through a museum dedicated to preserving Canada's cultural heritage.

TUESDAY, AUGUST 29 —

Merrickville Day Trip

Merrickville is a charming little village situated just outside of Ottawa. The history of the 1790's has been preserved in this village and is reflected in the architecture and lifestyles. We'll transport you to Merrickville aboard a comfortable motorcoach and on your arrival you'll begin your visit with an historical walking tour. Lunch will be served outdoors (weather permitting) at one of the quaint old inns offering typical Eastern Ontario cuisine. The afternoon is to be enjoyed at your leisure as you stroll through the village's many craft and antique shops.



EXHIBIT HALL DRAWS

WIN! WIN! WIN! WIN! WIN! WIN!

Win a Harley Davidson!



Aurum Ceramic/Classic is once again offering registered dentists the opportunity to win a **Harley Davidson Sportster 1200**. Visit the Aurum Ceramic/Classic booth in the exhibit hall to drop off your ballot then cross your fingers and hope your name is drawn.

Win 2 Air Canada tickets!

Pre-registered participants will have a chance to win **two economy class return tickets** good for any destination serviced by Air Canada (some restrictions apply). **Register before July 21, 1995 to be eligible for a draw ticket.** Deposit your ticket at the designated location in the exhibit hall for this draw (your ticket will have details).

*Perhaps you'll take
the trip you've
always wanted!*



AIR CANADA
For all the world

Lunch Tickets!

Pre-registered participants may receive tickets for lunch in the food venue just outside the exhibit hall.

The tickets have a pre-determined value and are given out randomly by our computer system.



When you receive your convention tickets, look at them closely — **you may just be one of the lucky participants.**

Exhibit Hall Door Prizes!

Ten (10) convention delegates will receive surprise gifts each day the Exhibit Hall is open!

At 12:00 noon and 4:00 pm on both Monday and Tuesday, 5 names will be drawn and a gift valued at approximately \$100 each will be given to the lucky winners.

Look for these tickets in your convention package and remember to visit the Exhibit Hall and deposit your draw tickets in their appropriate boxes to qualify.



THE CDA 1995 CONVENTION HAS AN EXHIBIT HALL OF FUN!

CANADIAN DENTAL ASSOCIATION CONVENTION

Ottawa • August 26 - 29, 1995

GST Registration Number: R106845209

ONE FORM PER PERSON

PRE-REGISTRATION & HOTEL RESERVATION FORM • Please PRINT

1. Obtain **1 FORM FOR EACH INDIVIDUAL** you would like to register. You may photocopy the enrolment form, or you can obtain additional forms by contacting CDA Conventions at 1-800-267-6354.
2. **EACH** individual's name should be printed clearly in the appropriate section. **EACH** individual form should select a **DELEGATE TYPE** in order to register for the Convention.

Check one: ☐ Dr. ☐ Mr. ☐ Ms.	Family Name		Sex: ☐ M ☐ F
	First Name		
Street address			
City		Province	Postal Code
Office Telephone ()		Home Telephone ()	Fax ()
CDA Membership Number		License Number	

LIMITED ATTENDANCE LECTURES

Saturday, August 26th —

Terry Donovan — Aesthetic/Restorative Dentistry — All-day lecture
Dentist \$ 135 _____
Dental Staff (non-dentist) \$ 65 _____

Sunday, August 27th —

W. Charles Blair — Achieving Financial Independence — Half-day lecture
Dentist (7% GST included) \$ 95 _____
Spouse (7% GST included) \$ 40 _____

W. Charles Blair — Dental Practice Transition — Half-day lecture
Dentist (7% GST included) \$ 95 _____
Spouse (7% GST included) \$ 40 _____

Donald Rolfs — Periodontal Disease — All-day lecture
Dentist \$ 135 _____
Dental Hygienist \$ 65 _____

Alan Boghosian — Dental Materials — All-day lecture
Dentist \$ 135 _____
Dental Staff (non-dentist) \$ 65 _____

HANDS-ON COURSES

Saturday, August 26th —

Alan A. Boghosian — Dental Materials — Half-day hands-on course
Dental Assistant (limited to 50 participants) \$ 95 _____

James Grisdale — Scaling & Root Planing — Half-day hands-on course
Dentist / Dental Hygienist (limited to 40 participants) \$ 115 _____

John Cox — Implants
1 1/2 DAY COURSE: SATURDAY AND SUNDAY (AM)
Dentist (limited to 50 participants) \$ 295 _____

Sunday, August 27th —

Stanley Malamed — Emergency Medicine in Dentistry — All-day hands-on course
Dentist/Staff (limited to 30 participants) \$ 295 _____

Jeffrey A. Sherman — Electrosurgery — Half-day hands-on course
Dentist (limited to 40 participants) \$ 115 _____

Monday, August 28th —

Donald Rolfs — Periodontal Surgery — All-day hands-on course
Dentist (limited to 40 participants) \$ 295 _____

St. John Ambulance — CPR — All-day hands-on Certification course \$ 35 _____

Tuesday, August 29th —

Salam Sakal — Advanced Endodontics — All-day hands-on course
Dentist (limited to 40 participants) \$ 195 _____

GST is included in the Limited Attendance Practice Management courses. GST is not charged on Limited Attendance and Hands-on scientific courses. Lunch is included in all-day Limited Attendance and Hands-on courses (except for CPR).

CONVENTION

Choose only one delegate type. 1 registrant per form.

☐ **Dentist**
Member of CDA \$ Nil _____
Non-member of CDA (7% GST included) \$ 175 _____

☐ **Spouse** (7% GST included) \$ 98 _____

☐ **Dental Hygienist** (7% GST included) \$ 98 _____
Dental Hygienist (See note below)* \$ Nil _____

☐ **Dental Assistant** (7% GST included) \$ 98 _____
Dental Assistant (See note below)* \$ Nil _____

☐ **Office Personnel, Office Manager, Receptionist** (7% GST included) \$ 98 _____
Office Personnel, Office Manager, Receptionist (See note below)* \$ Nil _____

☐ **Dental Technician** (7% GST included) \$ 98 _____

☐ **Children (6-12 years)** Child's Age: _____
Monday program (7% GST included) \$ 48 _____
Tuesday program (7% GST included) \$ 48 _____

☐ **Student Dentist** \$ Nil _____
☐ **Student Hygienist** \$ Nil _____
☐ **Student Dental Assistant** \$ Nil _____

* Students must provide proof of full-time attendance.

***NOTE:** Every dentist enrolled for the Convention can register two (2) non-dentist staff members for the convention proper **FREE OF CHARGE**. The first or second non-dentist staff member to register *with* a dentist, choose "Registration Fees" Nil. Send Registration Form with that of the dentist.

SOCIAL EVENTS

- ☐ **Opening Ceremony** — Sunday, August 27th
(Subject to space availability — One ticket per Registration Form)
Will attend ☐ Yes ☐ No \$ Nil
- ☐ **Meet & Greet** — Sunday, August 27th
..... (7% GST included) \$ 50
- ☐ **President's Gala** — 50's Dance — Monday, August 28th
..... (7% GST included) \$ 75
- ☐ **Wine Tasting Reception** — Tuesday, August 29th
..... (7% GST included) \$ 25
- ☐ **Golf Day** — Sunday, August 27th
..... (7% GST included) \$ 98
- ☐ **Fun Run** — Tuesday, August 29th a.m.
..... (7% GST included) \$ 20
- ☐ **Visits and Tours**
Monday tour and luncheon (7% GST included) \$ 50
Tuesday tour and luncheon (7% GST included) \$ 50

TOTAL \$

Person/company responsible for payment: _____

☐ I wish to pay the above total by credit card: ☐ MasterCard ☐ VISA

Card # _____ Expiry date _____

Name of Cardholder _____

SIGNATURE _____

☐ I enclose a cheque payable to the Canadian Dental Association.
Post-dated cheques will not be accepted.

CANCELLATION POLICY:

- Cancellation received, in writing, on or before July 21, 1995 — full refund
- Cancellation received, in writing, after July 21, 1995 — subject to a 25% administrative charge

NO REFUND AFTER AUGUST 18, 1995



INFORMATION ON REGISTRATION:

All participants registered for the Convention:

- have access to all general lectures of the Convention proper
- have access to the exhibit hall
- have access to the Opening Ceremony
- are entitled to register for the appropriate limited attendance lectures and hands-on courses
- are entitled to register for social events, visits and tours

Spouses and children have access to the Opening Ceremony only if they register for one or more of the Convention's day programs or if registered for the Convention. Spouses not registered for the Convention do not have access to the general lectures or to the exhibit hall.

To ensure that your requests are met — **please register early.** Advance registrations will be accepted until **July 21st, 1995** after which date forms will be returned to the sender. Each on-site registration will be subject to a \$30 administrative fee (GST included).

MAKING YOUR AIRLINE RESERVATIONS

Special arrangements have been made with Air Canada to offer participants discounts on airfares.

To take advantage of this service, you must call Air Canada Convention Central at **1-800-361-7585** and quote event **CV950931**.

HOTEL RESERVATION

Type of Room:

☐ Single ☐ Double ☐ Twin ☐ Other (please specify) _____

☐ Smoking ☐ Non-Smoking

Special Requests: _____

Sharing with _____

Indicate your choice of hotel* (by numbering the boxes):

☐ Westin Hotel (CDA Headquarters) \$128.00 single/double

☐ Château Laurier \$127.00 single/double

☐ Sheraton \$110.00 single/double

☐ Novotel \$99.00 single/double

* Prices do not include taxes.

Arrival Date: _____

Arrival Time: _____

Departure Date: _____

All changes and/or cancellations must be made **IN WRITING** through CDA Conventions. Fax to (613) 523-3062.

In order to reserve a room, a guarantee for the first night is essential. The guarantee will apply to the first night **ONLY**. To cancel your reservation advise CDA Conventions at least three (3) days prior to your projected arrival date.

CHEQUES WILL NOT BE ACCEPTED.

☐ MasterCard ☐ American Express ☐ VISA

Card # _____ Expiry date _____

Name of Cardholder _____

SIGNATURE _____

DEADLINE for Reservations: July 21, 1995

ACCOMMODATION

- ☐ I do not require accommodation
- ☐ Other arrangements have been made

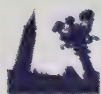
MAIL Pre-registration and Hotel Reservation Form with payment to:

1995 CDA Convention
1815 Alta Vista Drive
Ottawa, Ontario K1G 3Y6

OR FAX

(if paid by credit card): (613) 523-3062

Dentists, Hygienists, Assistants, Office Personnel
& Technicians registering by July 21, 1995
will be eligible to win two tickets **anywhere**
Air Canada flies in Europe and North America!
(Some restrictions apply.)



OTTAWA 1995
August 26 - 29

CDA 1995 OUT-OF-COUNTRY SEMINARS



The Gateway to the Orient

Organized by the Hong Kong Dental Association and the World Dental Federation, the FDI 1995 World Dental Congress will take place between October 23rd and 27th. Dental professionals from the world over will gather together for a week of learning and discovery.

Together with Tourcan Vacations, the CDA has organized a comprehensive package for dentists, members of the Canadian Dental Association, which includes airfare and 5 nights accommodation (with breakfast) in some of the finest hotels in Hong Kong. Day trips in and around the Hong Kong area have also been arranged.

FDI 1995
HONG
KONG

Often referred to as the Gateway to the Orient, Hong Kong's location enables you to take advantage of exciting post-congress tours into China and other fascinating asian locations. The following post-congress tours are available to choose from:

Bali (October 26-30), a first class ride on the Orient Express that will take you from Bangkok to Singapore (October 25-28), a tour of Bangkok and Singapore (October 26-31), a twelve day visit to China (October 26-November 6) or a deluxe motorcoach tour of the Bunga Raya — Singapore, Malaysia and Bangkok (October 26-November 5).





1996 Out-of-Country Seminars *Custom Designed for You!*

WE NEED YOUR INPUT IN PLANNING OUR 1996 OUT-OF-COUNTRY SEMINARS PROGRAM.

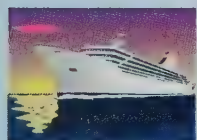
You will find below a list of destinations that we will be offering for the entire year. But, we want to hear from you before we finalize dates and last details. If you are interested in a destination, call our office and let us know what dates are best for you. We will try to accommodate your requests as best we can!

As you know, CDA Out-of-Country seminars are not just another trip. Visits to dental clinics and hospitals, meeting with local dentists and lectures are part of every tour. **CDA will give dentists a Certificate of Attendance.** Mix business with pleasure and plan your trip today!

FDI 1996 World Dental Congress **— Orlando, Florida —**

The American Dental Association will host the FDI 84th World Dental Congress from September 28 to October 2, 1996 (set dates). Join other Canadian delegates who will attend the Convention in the city which is home to your favourite Disney characters. Take advantage of pre- and post-congress tours and turn your trip into a real holiday. These will include:

Caribbean Cruise



September 21 - 28 (set dates)

Arrive in Orlando tanned and refreshed for the Congress after an exotic 7-day cruise.

Barbados

Seven or 14 days of idyllic weather and white sandy beaches. Rest and relaxation are on the itinerary of this post-FDI tour.

Walt Disney World

What can we say about Disney World that you don't already know? Bring the family to FDI and stay over an extra 3, 5 or 7 days.



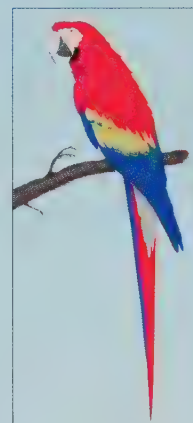
Guatemala

Come to the heart of the Mayan world and discover one of the most interesting and varied folklore in the world during this one week post-FDI tour.

Other Out-of-Country Seminars

Costa Rica (February)

Spend two weeks in one of the most biologically diverse countries of the world, a treasure house of flora and fauna.



Caribbean Cruise (February)

Sail the Caribbean on an exotic 10-day cruise that will cater to your every need.

Egypt (March)



You will be charmed by the beauty of the Nile River, awed by the world famous pyramids, sphinx and thrilled by the vibrant city of Cairo.

South Africa (May)

One visit is all that is needed to verify the claim of one of the most beautiful countries on earth.

Morocco (July)

With its vast kaleidoscope of landscapes and customs, Morocco invites you to discover its riches.



Borneo (November)

Situated on the equator, Borneo is a rugged land of thick rainforests through which flow tremendous rivers down to a coastline of exotic tropical beaches.

**For more information or
to receive tour details, contact
CDA Conventions at 1-800-267-6354 or
Tourcan Vacations at 1-800-263-2995.**



OTTAWA 1995

August 26 - 29

HANDS-ON COURSES

**Hands-on Courses are restricted to a set number of spaces in each course.
To ensure that you obtain a seat in one of these sessions, send in your registration today.**



DENTAL MATERIALS FOR DENTAL ASSISTANTS

Alan A. Boghosian, D.D.S. • Chicago, IL
Saturday, August 26, half-day session

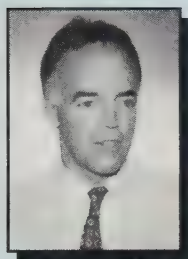
In this course, designed for Dental Assistants, Dr. Boghosian will discuss the properties of, and allow hands-on mixing and handling of traditional and more recent dental materials.



ELECTROSURGERY

Jeffrey A. Sherman, D.D.S. • Oakdale, NY
Sunday, August 27, half-day session

This course will offer discussion and demonstration of all electrosurgical cutting, coagulation and fulguration modes, on the latest electrosurgical/radiosurgical equipment.



ROOT PLANING AND SCALING

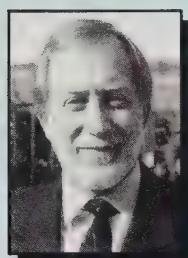
James Grisdale, D.D.S. • Vancouver, BC
Saturday, August 26, half-day session

This hands-on course covers the in-depth use of ultrasonic instrumentation. The participant will be exposed to the theory and practice of ultrasonics and be given an opportunity to utilize the latest in piezo electric instrumentation on a typodont.

CPR — Basic Rescuer Level 'C' Certification Course

St. John Ambulance
Monday, August 28, all-day session

The CPR level 'C' course has been designed to Canadian Heart Foundation standards. This five to six hour course is geared to health care professionals.



EMERGENCY MEDICINE IN DENTISTRY

Stanley F. Malamed, D.D.S. •
Los Angeles, CA
Sunday, August 27, all-day session

In this program, Doctor Malamed will review the essentials of emergency management and will provide the participants with the opportunity to gain clinical skill in the management of various simulated "emergency situations".



PERIODONTAL SURGERY FOR THE GENERAL PRACTITIONER

Donald Rolfs, D.D.S. • Union, WA
Monday, August 28, all-day session

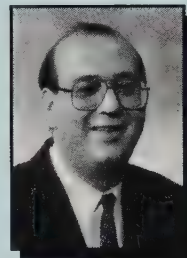
This hands-on course for dentists will detail the two most common and powerful periodontal surgical procedures effected by the general practitioner: a Widman flap procedure and an open flap curettage procedure.



IMPLANTS: Basic Prosthetic Certification Course

John Cox, D.D.S., Dip. Pros., MSc. •
Ottawa, ON
Sunday, August 27, half-day session
(prerequisite lecture all day Saturday)

During this course, edentulous and partially edentulous procedures will be done. Actual implant components will be used on models to carry out prosthodontic procedures while slides will demonstrate the sequence as procedures are performed.



ADVANCED CONCEPTS IN ENDODONTICS

Salam Sakkal, D.M.D., M.S. •
Montréal, QC
Tuesday, August 29, all-day session

This workshop will review many techniques that will help you improve your skills. You will prepare 45 degree curved canals; obturate in 3 D these canals using the modified lateral compaction and Sealextra root canal sealer; prepare a dowel space to receive an Endo-composipost University of Montréal.

LIMITED ATTENDANCE LECTURES



OTTAWA 1995
August 26 - 29

Limited Attendance Lectures are restricted to a set number of spaces in each lecture. To ensure that you obtain a seat in one of these sessions, send in your registration today.



UPDATE ON ESTHETIC RESTORATIVE DENTISTRY

Terry Donovan, D.D.S. • Los Angeles, CA
Saturday, August 26, all-day session

This presentation will delineate the procedures essential for success with conventional and contemporary adhesive restorative dentistry. An objective comparative evaluation of many of the newer products on the market will also be given with an emphasis placed on clinical manipulation of these products.

Topics to be covered include essentials for soft tissue esthetics in fixed prosthodontics; effective gingival displacement; new materials and techniques for fabrication of provisional restorations; review of impression materials; New techniques with impression materials; solutions for fractured porcelain; metal bonding; current thoughts on bonding to tooth structure; enamel bonding, dentin bonding; conservative esthetic techniques; bonded porcelain and essentials for success in fixed prosthodontics.



CONTEMPORARY DENTAL MATERIALS AND THEIR CLINICAL APPLICATION

Alan A. Boghosian, D.D.S. • Chicago, IL
Sunday, August 27, all-day session

The fast evolving world of dental materials and the rapid development of new techniques allow today's practitioner to restore compromised dentition with unparalleled efficiency, either functionally or aesthetically. This session will review dental materials and techniques with an emphasis on prosthodontics and adhesive material applications.

The first portion of the course will review elastomeric impression materials, concepts of tooth preparation, temporization and tray selection. In addition, a variety of impression techniques will be presented.

Then, techniques for implant impressions, new ceramo-metal systems and cementation will be presented. Dr. Boghosian will discuss adhesive materials and their application in the restoration of Class V lesions. This discussion will be based on the results of clinical research conducted at Northwestern University.



PERIODONTAL DISEASE: What it is and what we can do about it

Donald Rolfs, D.D.S. • Union, WA
Sunday, August 27, all-day session

This is a down-to-earth, fun, interactive day filled with mind-bending paradigm shifts that bring most perio therapy into the realm of the general dentist.

Similarities and differences between dental and periodontal therapy will be explored, illustrated, and explained. Some of the thought process which works so well and is so successful for restoring teeth does not transfer to perio. A step-by-step guide for "thinking periodontally" will be provided.

How to attain 100% compliance with your perio patients will be explored. If patient compliance with oral hygiene instruction is a source of frustration in your office, this interactive learning experience will put new joy into your perio program.



ACHIEVING FINANCIAL INDEPENDENCE

W. Charles Blair, D.D.S. • Charlotte, NC
Sunday, August 27, half-day session

This hard-hitting program designed for dentists and their spouses contains "inside information" that you simply can't find elsewhere — gleaned from years of experience working exclusively with the dental profession. You'll learn how to plan investments, develop a personalized retirement plan, improve practice profitability, save thousands in unnecessary insurance costs and discover tax-free income secrets.

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This course is designed for dentists and their spouses who are considering entering into an associateship or partnership relationship or the purchase or sale of a professional practice within five years. The session is designed to improve the planning process and to control the impact these transactions will have on their professional, financial, and personal lives.

The course is presented in a fast-moving, non-technical manner. It is not recommended for dental staff personnel.



OTTAWA 1995
August 26 - 29

GENERAL SCIENTIFIC LECTURES

MONDAY, AUGUST 28TH

MARION BALLA, M.Ed., M.S.W. • *Ottawa, ON*

"Effective Communication with Staff and Clients in the Dental Environment"

"Problem Solving Techniques for the Dental Environment"

HAROLD L. CROSSLEY, D.D.S., Ph.D.

Baltimore, Rhode Island

"Pharmacological Update for the Dental Practitioner"

W. CHARLES BLAIR, D.D.S. • *Charlotte, NC*

"Overhead Control That Makes Cents"

PIERRE BOUDRIAS, D.M.D., M.S.D. • *Montreal, QC*

"Post and Core: An Update"

SHIMON FRIEDMAN, D.M.D. • *Toronto, ON*

"Biological Considerations of Endodontic Innovative Techniques"

"Replantation of Teeth — The Endodontic Perspective"

GRIEVE MEMORIAL LECTURE

Robert J. Vanarsdall, D.D.S. • *Philadelphia, PA*

"Diagnosis and Treatment of Transverse Skeletal Discrepancy"

JOHN KANCA, D.M.D. • *Middleburg, CT*

"State-of-the-Art Adhesive Dentistry"

MYER S. LEONARD, M.D., D.D.S.

Minneapolis, MN

"Ups and Downs, Joys and Grievs of Office Oral Surgery"

"All The Medicine You Wanted To Know Without Going To Medical School"

STANLEY MALAMED, D.D.S. • *Los Angeles, CA*

"Trouble-Shooting the Mandibular Block"

JACK PRESTON, D.D.S. & **JOHN KHADEMI**, D.D.S.

Los Angeles, CA

"Computers in Dentistry"

ROBERT SCHALLHORN, D.D.S., M.S. • *Aurora, CO*

"Current Concepts in the Management of Adult Periodontitis"

"Predictable Periodontal Regeneration is a Reality"

CLYDE SCHULTZ, D.D.S. • *San Francisco, CA*

"Recession Proof Your Practice: Strategies for Minimizing the Effects of Economic Downturn"

"Team Communication Strategies: Building a Productive and Secure Practice"

TUESDAY, AUGUST 29TH

SEBASTIAN G. CIANCIO, D.D.S., Dip. Perio.

Buffalo, NY

"Dentotherapeutics"

"Perio-Chemotherapeutics"

MICHEL COUTURE, D.M.D., Dip. Perio.

Montreal, QC

"The PSR Programme: Is your Practice Up to Date in Periodontics?"

HELEN GRAD, M.Sc., Phm. • *Toronto, ON*

Controversies Surrounding Temporomandibular Disorder (TMD) II

MIRIAM GRUSHKA, M.Sc., D.D.S., Ph.D.

Toronto, ON

Controversies Surrounding Temporomandibular Disorder (TMD) I

WAYNE HALSTROM, D.D.S. • *Vancouver, BC*

"Update on Snoring and Sleep Apnea"

ROBERT HENRY, D.D.S., M.S. • *San Antonio, TX*

"Pulp Therapy in Periatric Dentistry"

"Pediatric Dentistry: General Overview"

ANITA JUPP • *Burlington, ON*

"Teamwork and Success Go Hand in Hand"

"Sharing a Common Vision for Changes in Dentistry"

JOHN KHADEMI, D.D.S., M.S.

Los Angeles, CA

"What's New in Endodontics?"

SAM KUCEY, D.D.S., F.R.C.D.C., Dip. ABOMS

Ottawa, ON

"Osseointegration Then and Now: A 10 Year Retrospective Reviewing the Impact of Osseointegration in the Practice of Dentistry"

MURRAY McDONALD LECTURE

Jane Fulton, Ph.D. • *Ottawa, ON*

"Bordering on the Possible: Health Care Lessons from the Global Village"

JOHN MCDUGALL, M.D. • *Santa Rosa, CA*

"Nutrition in the Cause and Prevention of Common Diseases"

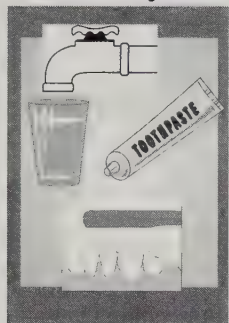
MARK SPATZNER, D.M.D., Dip. Perio.

Westmount, QC

"Regenerative Periodontal Therapy: The Clinician's Viewpoint"

"Regenerative Periodontal Therapy: What the Staff Wants to Know"

FLUORIDE



Toward a Caries-Free Society — Fluoride Therapies For Today and The Next Century

Hardy Limeback, B.Sc., PhD, DDS

When was the last time that a 20-year-old presented in your dental office for the extraction of a grossly carious molar?

Unless your practice treats institutionalized young adults, street kids, recent immigrants, or indigenous people living in remote communities, such extractions are, thankfully, rare events. And this situation is not unique to Canada. Young people living in most other industrialized Western countries are also keeping their molars. In fact, the decay rate for the current under-30 generation has declined to almost zero, even in areas where drinking water is not fluoridated, and this phenomenon is occurring worldwide.¹⁻³

The dental profession should take collective pride in helping to control dental caries — the most prevalent and, by some people's calculations, the third most costly human affliction on this planet. While some of the decline in caries may be attributed to better nutrition and better oral hygiene, there's no question that most of this remarkable public health achievement can be credited to the fluoride ion.

Imagine. Before the next generation reaches 30 years of age, the extraction of carious teeth will have become a rare event for people of all ages. In fact, dental caries will probably be completely wiped out in Canada, with the exception of a handful of high-risk patients.

Periodontal disease is also on the way out. Although you might think that periodontal disease could continue to cause edentulism in the aging population, it is anticipated that improved oral hygiene will effectively control this condition in the near future.⁴ This means that the CDA goal of "Your Teeth: Good for Life" is likely to be realized by the year 2020.

Most of the "endo," crown and bridge, extractions, new dentures, and implants that are provided to Canadians after 2020 will probably be for cosmetic purposes (i.e., crowding, congenital defects), or to repair or replace teeth that were injured accidentally. If I were a 25-year-old prospective postgraduate student today, and I planned to pursue a specialty that involved treating patients affected by advanced dental caries (e.g. implantology, prosthodontics, endodontics), my enthusiasm would be more than a little dampened by the fact that there could be very little work for me to do by the time I reached 50.

Some readers of this journal will likely recall the pre-fluoride era. Prior to the Second World War, and in the decade that followed, caries was a major health problem. Because extractions were routinely used to treat badly decayed teeth, the typical child or young adult had several missing teeth. Many of their remaining tooth surfaces were decayed and required restorations. If this typical child was fortunate enough to have parents with the financial means,

these teeth were often restored. Otherwise, once the tooth became badly decayed, it was removed.

The post-war Baby Boomers enjoyed improved living conditions, which resulted in better nutrition and better overall oral hygiene. At the same time, however, there was also an increase in the consumption of processed carbohydrates,⁵ and dental caries quickly became a public health problem.

Canada's dental profession took prompt action. Fluoride was introduced into the water supplies of several communities, beginning with Brantford, Ontario, in June 1945. Dental public health programs were initiated in Canadian schools to provide dental screening, education, and fluoride rinse or tablet programs. Private practitioners instituted preventive programs in their practices. And the dental industry developed and introduced therapeutically effective dentifrices.

Today, it is clear that the widespread use of fluorides in Canada during the 50 years since the Brantford/Sarnia/Stratford initiative is the main reason for the dramatic improvement in the oral health of all Canadians.

Dental caries is a complex, multi-factorial disease. Every school child is taught that the bacteria on tooth surfaces can convert dietary sugar into acids that subsequently dissolve dental hard tissues. They also learn that fluoride prevents tooth decay by "making

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the teeth stronger," and are encouraged to use fluoridated toothpaste every day to prevent caries. In fact, the use of fluoridated toothpastes can be credited with contributing significantly to the worldwide decline in caries.¹⁻³

While some people still demonstrate significant levels of dental decay, today's improved public health measures will undoubtedly result in lower caries levels in high-risk individuals, and it is anticipated that the caries rate for the overall population will fall to almost zero as we head into the next century.

To understand why fluoride has been so remarkably effective in controlling dental decay, and predict how it will be used in future preventive dentistry programs, its mode of action must be fully understood. After 50 years of human studies involving water fluoridation, fluoride supplements, fluoridated toothpastes, and fluoridated mouthrinses, as well as countless laboratory studies, we have gathered a lot of information on how fluoride interacts with cariogenic bacteria, how it influences the components of saliva or other oral fluids, and how it influences the dynamic processes of mineral loss and redeposition during the caries process.

Does Fluoride Really Make Teeth More Resistant To Decay Before The Decay Process Starts?

For years, it was generally believed that the incorporation of fluoride into the tooth enamel made the enamel more resistant to dissolution, and to the first challenges of the acids produced by new deposits of cariogenic bacteria on the tooth surface. First-year University of Toronto dental students still carry out experiments, in their oral biochemistry laboratory sessions, to demonstrate that enamel treated with topical fluoride shows a higher fluoride content than normal enamel, and that fluoride-treated enamel powder dissolves more slowly at pH 5.5 than untreated enamel powder.

An even simpler version of this type of experiment was recently used in Crest's "Eggsperiment" television commercial. An egg

shell treated with fluoridated toothpaste remained hard to the touch even after it was soaked in a weak acid (vinegar).

These experiments demonstrate fluoride's ability to "strengthen" calcium-containing hard tissues, but not how fluoride works to prevent caries. Studies done in the laboratory showed that non-human enamel mineral containing fluoride at concentrations similar to those found in humans (3,000 ppm to a depth of 0.5 mm in a fluoridated area, 2,000 ppm in a non-fluoridated area) could not be distinguished from human enamel in terms of its solubility.⁶ Shark enamel, which is almost pure fluorapatite, had little resistance to attack by human cariogenic bacteria in a human intraoral caries model system.⁷ Nevertheless, very high (up to 10,000 ppm) levels of fluoride can be obtained on the surface of human enamel. This enamel can be up to 30 per cent more resistant to dissolution than enamel that is low in fluoride content, which is one of the reasons why teeth will usually demineralize just below the surface layer of enamel.

High levels of fluoride can be temporarily achieved in the surface layers of enamel following professional topical fluoride treatments.⁸ Fluoride levels in the 10,000 ppm range, however, can only be permanently achieved if teeth are exposed to high levels of fluoride during development. These teeth would also have moderate dental fluorosis, to the extent that the resulting enamel defects would be visible and undesirable.⁹ The traditional goal in preventive dental practices, while fast becoming outdated, is to boost the enamel fluoride levels. However, this goal is not justified on the basis of simple chemistry.

Just a Tiny Bit Of Fluoride in Saliva Is All You Need

The caries process involves repeated exposures of the tooth to demineralizing acid solutions, followed by its exposure to remineralizing solutions such as saliva.¹⁰ Because of the dynamics of this de- and remineralization (demin-remin) cycle, the effect of small amounts of fluoride in the solution

is much more profound than the effect of large amounts of fluoride in the mineral phase. For example, fluoride at levels as low as 0.1 to 0.2 ppm in the saliva not only prevents the dissolution of fluorapatite from the enamel, but also greatly accelerates the formation of apatite.¹¹ A small amount of fluoride in solution actually results in the system being supersaturated with fluorapatite. When this occurs, not only is less apatite dissolved in acid, the fluoride in solution goes on to stimulate the deposition of more apatite when the pH returns to neutral.

Following these demin-remin cycles, the subsurface, incipient lesion undergoes considerable chemical change in addition to the enrichment of the incipient lesion with fluorapatite. For example, because most of the original apatite dissolves and redeposits, crystaldestabilizing components such as magnesium and carbonate escape from the subsurface lesion, which allows the formation of apatite that is low in magnesium and carbonate and rich in fluorapatite. The net result is that the incipient lesion becomes even more resistant to further mineral loss and acid dissolution than the surrounding enamel.¹² Having fluoride present in low concentrations in the saliva, several times a day, is clearly the most effective way to build up resistance to tooth decay.

The low-dose topical cariostatic mechanism of fluoride is believed to be the principle mechanism of action in preventing caries.⁸ This mechanism may explain why fluoridated water benefits the permanent teeth of adults who move into fluoridated areas, and why this protection is lost when the person moves away from the fluoridated area or when water fluoridation is discontinued. It also explains why chewable fluoride tablets work better than tablets that are swallowed, and why fluoride lozenges work even better than the chewable tablets.¹³

Do Topical Fluorides Work The Same Way?

Clinical studies have shown that exposing the dentition to very high fluoride concentrations, semi-an-



nually or even annually, will reduce caries incidence, in some cases as effectively as fluoridated water.¹⁴ The cariostatic mechanism of topical fluorides seemed confusing to many researchers at first, in that the extremely high level of fluoride on the surface of the enamel was gone in one day, but the cariostatic effect of the treatment lasted for months. This was explained by the surface deposition of calcium fluoride (CaF₂), a form of inorganic fluoride that is insoluble at neutral pH but sparingly soluble in weak acid.^{8,15}

Ripa's 1990 study found that low pH, acidulated-phosphate fluoride (APF) topicals performed better than neutral pH sodium fluoride gels.¹⁴ It was subsequently shown that the APF treatment etched the enamel surfaces to provide for more retention of the calcium fluoride deposits.⁹ During the demin-remin cycles, this form of fluoride remains unreactive at neutral pH. It partially dissolves at low pH, however, releasing a small amount of fluoride into the solution. In turn, this produces a localized fluoride ion concentration in the saliva that is similar to the concentration achieved with fluoridated water, fluoride supplements and toothpastes. Researchers have now discovered that it can take months for this form of slow-release fluoride to deplete itself,¹⁵⁻¹⁸ and Rølla and his colleagues believe that topical fluoride varnishes work in much the same manner.^{8,16}

Fluoridated Toothpastes Work Both Ways

The use of fluoridated dentifrices and mouthrinses in the oral cavity provides most people with one or two daily doses of fluoride at levels that are intermediate (in logarithmic terms) between fluoridated water and professionally-applied topical fluorides. Some studies suggest that fluoridated mouthrinses and toothpastes provide a sustained elevation of fluoride in the fluids of the oral cavity.¹⁹ However, when a person uses a mouthrinse or toothpaste containing 1,000 ppm of fluoride, the fluoride levels in saliva are only briefly elevated to

1,000 ppm. At this level of fluoride, a newly-formed enamel lesion would be maximally stimulated to remineralize. After tooth-brushing, the salivary fluoride levels rapidly decline to levels close to normal, but never return to the levels found in people who have never been exposed to fluoride.²⁰⁻²²

While some of the ambient fluoride found in the saliva of regular toothpaste-users comes from the toothpaste they ingest, much of it comes from the fluoride "depots" that form during tooth-brushing.¹⁹ These depots consist mostly of loosely-bound fluoride deposits on the mucosa, gingiva, and tongue, as well as on the plaque that is left behind after brushing. Salivary fluoride levels become elevated as these depots slowly deplete. In addition, a small amount of stable calcium fluoride is formed on the enamel surface. This calcium fluoride slowly dissolves during the day to provide a low-dose ambient fluoride exposure between brushings.^{8,16,19}

Several other recent findings lend support to this mechanism. Clinical studies have shown that toothpaste with only 250 ppm fluoride is less effective than regular toothpaste, which has 1,000 ppm fluoride. However, extra-strength formulations (1,500-2,500 ppm) provide only a marginal increase in protection against caries. This suggests that the depots that form with the use of regular toothpastes cannot really be boosted any further. Nevertheless, the effectiveness of toothpaste in raising salivary fluoride levels is greatly enhanced if it is left in the mouth and not rinsed away.²⁰⁻²²

Slow-release Fluorides (Modern Technology For a Simple Principle)

Slow-release fluoride systems that could ultimately provide months or even years of protection against dental caries are currently being tested in human studies. Devices such as copolymers and glass beads have also been developed. These devices release small amounts of fluoride all day long,²³ and have potential for the treatment of patients who are unable to

use toothbrushes and for those with an extremely high caries risk.

Slow-release fissure sealants may prove to be the ideal slow-release mechanism for fluoride, not only because they reliably prevent fissure caries, but also because they continue to release small amounts of fluoride into the saliva for years. It also appears that the fluoride content of glass ionomer cements can be replenished with the daily application of fluoridated toothpaste,^{24,25} thereby elevating the salivary fluoride levels for more prolonged periods. In one study, the placement of two glass ionomer cements per primary dentition actually elevated salivary fluoride levels to between 0.3 and 0.8 ppm for up to one year.²⁶

Fluoride Therapies For The Future

Water fluoridation is still the most effective, cost-efficient and equitable means of protecting people against caries. Its safety has been well established over the years, and it remains the fluoride therapy of choice for the general population.

Fluoridated toothpastes, when used on a daily basis, have proven to be equally effective at controlling caries as fluoridated water. In the years to come, the recommendation that both fluoride therapies be continued, with some adjustment of dosage,²⁷ will likely be subjected to considerable debate. However, it can be safely assumed that these two fluoride therapies are here to stay, and will be widely used in the next century.

Designing Fluoride Therapies For The Next Century: General Principles For Dental Practices

1. Be Aggressive, Individualize And Target

If fluoridated toothpaste is used regularly, or there is daily exposure to fluoridated water, or both, the incidence of caries should be low, and it should be limited to a select portion of the population that is at risk to develop caries. Current and new fluoride therapies should be aggressive, tailored to individual needs, and targeted to only those



people who are likely to develop caries.

2. Maximize Daily Fluoride exposure

All fluoride therapies should be designed to:

- Ensure that the fluoride levels in the fluids of the oral cavity average 1.0 ppm
- Ensure that these elevated fluoride levels are relatively sustained (i.e. 24 hrs/day). At the very least, ensure that fluoride levels are high during periods of de- and remineralization of enamel.

3. Limit fluoride ingestion

Since there is very little evidence to suggest that the systemic incorporation of fluoride into developing teeth will provide significantly more protection against caries, or that the ingestion of fluoride results in topical protection due to elevated salivary fluoride,⁹ there is no compelling reason for future fluoride therapies to include fluoride ingestion. Daily ingestion of excessive amounts of fluoride can cause dental fluorosis in children, and there is public concern that excessive fluoride ingestion in adults may result in yet-to-be-discovered long-term side effects. Logically, then, all currently-used fluoride therapies (other than fluoridated water) and all new fluoride therapies should be designed to limit fluoride ingestion.

Predictions For 2020

Public Health Programs

Water fluoridation will still be going strong in 2020, and will be especially useful in the developing countries where caries is becoming a real problem. Some European countries have opted to stop fluoridating the water supplies, but they have also invested heavily in public dental-health programs.

If communities in Canada decide to turn down water fluoridation in the next few years, despite the fact that it is still the preferred fluoride therapy for the general population, then public health units should be given the opportunity to provide an alternative. A comprehensive fluoride tablet or fluoride rinse program for all young

school children ensures equity, but is not cost-efficient. A good alternative might be to provide targeted preventive service, such as supervised tooth-brushing programs in the schools. The provision of semi-annual (or more frequent) professional topical fluoride applications to children at risk would be a second choice, although the cost would likely be too high to justify.

Needy children are already targeted by various food and social assistance programs. It is unlikely that the parents of these children would prevent schools from giving them free toothpaste and government-subsidized preventive dental service. A socially-conscious society would somehow find a way to ensure that the children at risk will receive the fluoride therapy they deserve.

New Developments In Consumer Oral Care Products

Because the early introduction of fluoridated toothpaste use in young children is a risk factor for the development of dental fluorosis,²⁸ extra-strength fluoride toothpastes, gels and solutions for home use will either be clearly targeted "for adults only" or be made available only by prescription. Fluoride-reduced toothpastes (250-500 ppm) have been introduced in Europe, and will likely become popular for use in Canada.

Fluoride-impregnated oral care products (e.g. fluoridated floss) have recently found their way to the marketplace. This author is unaware of any study to show that these — or any other similar products such as picks and wedges — provide any advantage over regular use of fluoridated toothpaste. However, fluoride-impregnated floss and tooth picks may become important oral care products if the use of traditional fluoride therapies should decline.

The ideal oral care product would likely be a toothpaste or gel used during daily tooth-brushing (a habit that is here to stay) that can elevate the fluoride levels of dental plaque (where all the action is) without significantly increasing saliva-fluoride levels. This would maximize caries protection and minimize ingestion of fluoride. For example, suppose a fluoride com-

plex (polymer or inorganic molecule with covalently attached fluoride) could be devised that fixes to enamel, where it would hydrolyse and release fluoride ions, but only after being exposed to plaque bacteria during acid production. Afterward, the fluoride compound that remained in the saliva would be ingested, but would pass through the GI tract unabsorbed because it is resistant to hydrolysis by GI tract enzymes. (Perhaps the dentifrice manufacturers are already testing such a compound.)

The manufacture of oral care consumer products is a multi-billion dollar industry worldwide. We can expect to see the introduction of dozens of new toothpastes, gels and mouthrinses over the next few decades. They may be formulated with various compounds designed to prevent caries in young and old teeth, and even in exposed root surfaces, by promoting remineralization, preventing demineralization, neutralizing acids, and interfering with bacterial adhesion, metabolism or acid production. Other formulations will combine anti-caries ingredients with compounds designed to reduce calculus formation, reduce gingivitis and periodontal disease, eliminate bad breath, reduce dentin sensitivity, whiten teeth and who knows what else.

Fluoridated Foods — New Drug Developments

If the ingestion of fluoride in adults continues to be of little concern, or it actually becomes desirable (i.e. to prevent osteoporosis), we may see the proliferation of specialized foods designed to prevent caries. Adding fluoride to sucrose or to certain snack foods has already been attempted.²⁹ Fluoridated chewing gum and candies are currently being tested for their anti-caries effect.³⁰ In Canada, however, if the manufacturers of a fluoride-containing food product claim that it reduces the incidence of dental caries, the product must be sold as a drug. Despite these regulatory restrictions, however, anti-caries food products have made it to market in Canada.³¹ The development of new foods that are fun to eat, non-fattening, and even beneficial for your teeth could be

an exciting prospect for the food industry in the years to come.

Slow-Release Fluorides

Glass ionomer cements may prove to be the ideal slow-release system for the prevention of new caries. However, professionally-applied topical fluorides are not cost-effective. The dentist-applied slow-release fluoride system may be valuable for high-risk patients, but what's really needed in the marketplace is a general-use consumer product that can be sold over the counter and be self-applied to teeth. A slow-release fluoride patch or button, applied in the oral cavity, could be inexpensive and simple to use, and should stay in place for a few weeks or months.

Other Technological Developments

Some day, we may witness the development of new high-tech ways to treat caries. Advances made in molecular genetics could lead to mouthwashes that contain a genetically-engineered LDH-deficient bacteria, mutans streptococci, which will be used to colonize teeth after caries-causing bacteria have been eliminated by chemotherapy.³² Susceptible pits and fissures could be made permanently resistant to caries by means of sophisticated office instruments such as lasers.³³

Conclusion

Dental researchers have figured out how to harness the unique chemical properties of the fluoride ion — an abundant and naturally-occurring element — to conquer caries. New ways of artificially delivering this element to decay-susceptible teeth will undoubtedly be devised before the next generation reaches middle age, early in the next century. By that time, perhaps the promise of "Your Teeth: Good for Life" will have been fulfilled. ■

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Dr. Limeback is an associate professor and the acting head of preventive dentistry in the University of Toronto's faculty of dentistry.

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Diagnosis and Management Of Vertical Root Fractures

Avi Schetritt, DMD, Dip. Perio.

Bjorn Steffensen, DDS, MS

ABSTRACT

Vertical root fractures constitute a significant management problem for dentists. The diagnosis of root fractures is difficult because several of their signs and symptoms are shared with other common dental or oral pathologies. However, reaching an accurate diagnosis is crucial to establishing the prognosis for a fractured tooth and selecting the appropriate treatment. This review describes current knowledge of the causes, diagnosis, and management of vertical root fractures, with special attention to the periodontal aspects of this condition.

Key Words: Periodontal disease, tooth fracture, radiology, endodontics.

SOMMAIRE

Pour les dentistes, la gestion des fractures radiculaires verticales est un problème important. Le diagnostic en est difficile à poser parce que plusieurs signes et symptômes peuvent s'appliquer à d'autres pathologies bucco-dentaires ordinaires. Cependant, un diagnostic précis est primordial pour établir le pronostic d'une dent fracturée et choisir le traitement adéquat. Dans cet article, on passe en revue les connaissances actuelles touchant les causes, le diagnostic et la gestion des fractures radiculaires verticales tout en accordant une attention spéciale aux facteurs d'ordre parodontal en cause.

Mots clés: maladies périodontales, fracture dentaire, radiologie, endodontie

Introduction

Root fractures are defined as fractures that involve dentin, cementum and pulp. This type of tooth fracture is relatively uncommon and only accounts for 0.5 to seven per cent of all fractures in the permanent dentition.¹ The majority of root fractures affecting the permanent teeth occur among patients in the 11- to 20-years age range, and involve the maxillary incisor region.^{1,2} The fracture lines are generally perpendicular to the long axis of the tooth and occur in the apical and middle third of the root. Fights and trauma caused from foreign bodies striking the teeth are frequent causes of these types of root fractures.

Vertical root fractures are usually characterized by a fracture line that extends from the coronal part of the tooth at a vertical angle toward the apex. The fracture may extend to different levels of the root. In contrast to horizontal root fractures, vertical root fractures are most often associated with endodontically treated teeth,³ and have been reported to occur predominantly in posterior teeth among patients between 45 and 60 years of age.⁴

Therefore, vertical root fractures are distinct from horizontal root fractures with respect to both cause and predominant patient group. In the following review, we

will discuss current knowledge about the causes, diagnosis, treatment and prognosis of vertical root fractures.

Causes Of Vertical Root Fractures

A relatively high number of vertical root fractures occur in endodontically-treated and post-restored teeth. An understanding of the causes of these types of fractures, as well as precautions that may prevent them, is developing.

Vertical root fractures have been observed in endodontically-treated teeth that have been restored using posts⁴ (Fig. 1). It has been proposed that posts, under load by occlusal forces, create intense concentrations of stress laterally and produce a strong wedging action apically. These forces can ultimately lead to the fracture of the root canal wall. Reinhardt et al⁵ found a greater potential for root fracture when teeth with diminished bone support were reconstructed using posts. This was especially evident when more than 4.0 to 6.0 mm of crestal bone had been lost.

Another frequently cited cause of vertical root fracture is the corrosion of posts made of non-precious metals.⁶ It has been suggested that the volume of these posts may expand due to the deposition of corrosion products on their surface, ultimately leading to the fracture of the surrounding root substance.⁷

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Root canal treatment may lead to a considerable loss of tooth structure during the debridement and shaping of the canals. In particular, the use of excessive pressure during the obturation of prepared root canals has been reported as a cause of root fractures.⁸

It has been proposed that root canal instrumentation, in combination with the dehydration of the root structure following endodontic treatment, reduces the strength of the root to such an extent that it may predispose the root to vertical fracture.⁹ However, the effect of dehydration on the mechanical strength of tooth substance has been questioned. In a recent study testing the fracture resistance of teeth with and without endodontic treatment, no difference in biomechanical properties was evident.¹⁰

Restorative procedures that have been implicated as causes of vertical root fractures in the vital teeth include forceful seating of intracoronar restorations such as inlays, and the placement of pins for amalgam restorations.¹¹

Finally, tooth morphology may also play a significant role in the incidence of root fractures. In an *in vitro* study, Rosen and Partida-Rivera¹² found that the incidence of root fracture increased as the mesiodistal diameter of the root decreased. Premolars, the mesiobuccal roots of upper molars, and the mesial roots of lower molars would therefore be more prone to root fractures. Indeed, many clinical studies have identified premolars and molars as the teeth most likely to have vertical root fractures.^{4,11}

These results indicate that the removal of excess tooth structure during the preparation of root canals, and the subsequent use of posts, are prominent causes of root fractures. To minimize the risk that fractures will occur following root canal treatment, the practitioner should avoid undermining the dentin walls during the preparation of the post space, and include a metal coping circumscribing the cervix of the tooth. There is evidence that the use of such design modifications may greatly reduce the risk of root fractures.¹³ Also, ex-

Table I

Signs and Symptoms of Vertical Root Fracture

Deep localized periodontal pocket
Gingival swelling and inflammation
Fracture line visible
Tooth mobility
Mobility of fragments
Fistula
Dull pain
Pain on biting

cessive forces should be avoided when placing intracoronar onlays or pins.

Diagnosis

Clinical Findings

It can be difficult to establish a diagnosis of vertical root fracture in teeth if no clinical mobility of the fracture segments is detectable. One reason for this difficulty is that the signs and symptoms produced by vertical root fractures can be associated with other conditions such as pulpal necrosis or failure of root canal therapy. In certain cases, the clinical diagnosis can only be confirmed by direct visual inspection of the root during a surgical explorative procedure. Important clinical findings are summarized in **Table I**.

The diagnostic signs produced by a vertical root fracture reflect, to a certain degree, the location and extent of the fracture line. A vertical root fracture may involve either the full length of the root or only a section of it, coronal or apical. It may extend from the root into the crown, and it may involve only one or both sides of the root.

The clinical signs and localized symptoms most frequently encountered with vertical root fractures are deep isolated periodontal pockets, periradicular radiolucency, dull pain, swelling, and the presence of a fistula.⁴ Mobility will only be detected if there is complete separation of the tooth fragments. In this instance, a smaller fragment may be loosened while

Table II

Radiographic Signs of Vertical Root Fractures

Radiolucent fracture lines
Halo-like apical radiolucency
Separation of root fragments
Periodontal bone defects
Resorption along the fracture line
Loosened retrofilling

the remainder of the tooth shows no increase in mobility. With extensive fractures, and when periodontal destruction has occurred, a wedging pressure by an instrument may reveal movement along the fracture line. This diagnostic procedure may also be performed during cavity preparation or endodontic treatment if a fracture is suspected but advanced symptoms are not yet obvious.

Intense reflection of light by a mirror, the use of a fibre-optic light source, and staining with an agent such as methylene blue are valuable tools to detect fracture lines that otherwise are not visible (**Fig. 2**). Since most vertical fractures occur in endodontically-treated teeth, a pulp vitality test is generally of little or no diagnostic value. In early, incomplete crown-root fractures, the patient may report symptoms that include pain, hot/cold, and sweet/sour sensitivity. When this occurs, a reliable diagnostic indicator is pain on mastication. It has been shown that chewing on a rubber Burlew wheel effectively simulates chewing on fibrous food, and thus is a valuable test in the diagnosis of incomplete crown-root fractures.¹⁴ Alternatively, a tooth slooth (Professional Results Inc.) may be used to create site-specific pressure on the cusps suspected to be involved in the fractured fragments. If characteristic symptoms are elicited from teeth without root canal treatment, a thorough endodontic evaluation will determine the extent to which the pulp is affected.

The periodontal examination of a tooth with a vertical root fracture will commonly reveal characteristic



Fig. 1: A maxillary premolar that had been reconstructed using a post developed a vertical root fracture extending to apical third of the root. The clinical examination revealed a deep localized periodontal pocket with exudation at the mid-buccal aspect corresponding to the vertical fracture.

findings. For example, once a fracture has extended below the soft tissue, it becomes a source of chronic inflammation to the periodontium. Subsequently, periodontal breakdown may occur, leading to the development of a localized periodontal pocket and loss of alveolar bone.⁷ The distinct pockets seen with root fractures are generally narrow. They may extend along the entire length of the fracture line, and in certain cases all the way to the apex of the tooth.¹⁵ The probing depth on either side of the pocket will be within normal limits and contrast distinctly with the deep pocket area (**Fig. 3**). Periodontal defects caused by inflammation or abscess formation at the site of the fracture frequently show purulent exudate. If two sinus tract-like pockets are observed on opposite sides of a root, as opposed to a single pocket, the probability of vertical root fracture is high. In fact, this "dual" sign is almost pathognomonic.¹⁶

Radiographic Findings

A radiographic examination is also important in the diagnosis of root fractures. In the condition's early stage — when only a hairline fracture is present, and well before any separation of the fragments is



Fig. 2: Methylene blue can be used to visualize a fracture line. In this patient, clinical symptoms indicated a vertical fracture in an unrestored maxillary premolar. A diagnostic cavity preparation and staining with methylene blue were required to reveal the fracture and verify the diagnosis.

evident — no visible radiographic changes are expected either in the tooth or in the adjacent bone. Even in cases where a fracture is readily apparent at surgical exposure, radiographic evidence of the fracture may be absent. This has been explained by the fact that the plane of the X-ray beam must be close to the plane of the fracture to permit radiographic detection⁶ (**Fig. 4**). It has been demonstrated that fracture lines are only diagnosed radiographically when the X-ray beam is within four per cent of the fracture plane. Even when the planes of the X-ray beam and fracture coincide, fractures may be radiographically obscured by posts or root canal filling materials.⁶

In spite of such diagnostic difficulties, several characteristic radiographic appearances are strongly suggestive of vertical root fractures.¹⁷ The most prominent radiographic signs of vertical root fractures are summarized in **Table II**. In advanced cases, radiolucent fracture lines along the root, with actual separation of root fragments, may be observed (**Fig. 5**).

Vertical fractures that specifically involve the apical portion of the root can produce a relatively thin halo-like radiolucent band adjacent to the apical root surface.

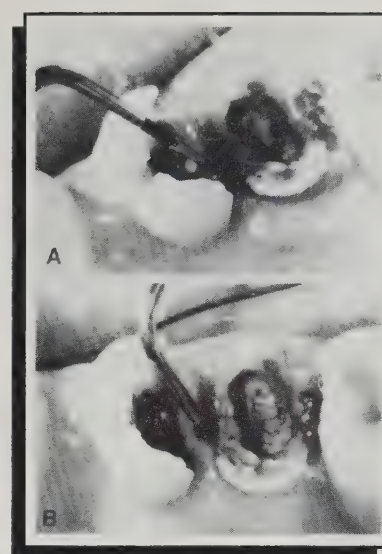


Fig. 3: Periodontal probing is a valuable tool in diagnosis of vertical root fractures. While a normal sulcus depth may be present on either side of the fracture line (A), a localized deep pocket is commonly detected at the site of the fracture (B).

This radiolucency will frequently extend to the mid-root level or even more coronally on both sides of the root.

When vertical fractures involve the coronal portion of the root, alveolar bone loss may appear radiographically as a linear radiolucency of variable width, extending apically from the crestal bone parallel to the root surface. It has been reported that the external root resorption produced by chronic inflammation may develop along the line of fracture, and that this may be observed radiographically as an irregular radiolucent zone adjacent to and overlying the root.¹⁷ If the root fracture occurred during root canal filling, radiopaque filling material may extrude into the fracture or into the periodontal ligament space. Vertical fractures extending through apical retro-preparations may cause retrofills to loosen from the root apex.

Direct Visual Inspection

A careful direct visual inspection can be performed if no conclusive clinical or radiographic signs can substantiate a definitive diagnosis of vertical root fracture. This examination of the root surface is carried out during an explorative surgical procedure. In



Fig. 4: This periapical radiograph of an endodontically-treated maxillary canine was exposed at an angle close to the plane of a vertical root fracture with minimal separation of the root fragments (closed arrows). A periapical radiolucency (open arrows).

advanced situations, vertical root fractures may be visible as fracture lines, or clear separation of the tooth fragments may be evident. In less distinct cases, the suspected root fracture may be stained a darker color than the surrounding tooth structure. Less obvious hair-line fractures may be detected by painting the suspected surface with a staining solution such as iodine or methylene blue.

Hairline fractures should be carefully differentiated from craze lines. Craze lines are frequently observed on root surfaces, but do not extend into the root canal and are of little clinical significance.

Transillumination with a fibre-optic probe is a valuable aid that may be used both prior to and during surgical exposure to visualize fractures. If the beam of light is directed through the tooth structure in a plane perpendicular to the fracture plane, it will break up at the fracture interface, resulting in an abrupt change in the light intensity at the fracture line.¹⁷

Periodontal Tissue Reaction Along Root Fractures

The pathogenesis of the periodontal changes that occur along root fractures is not well understood. It is, however, widely ac-

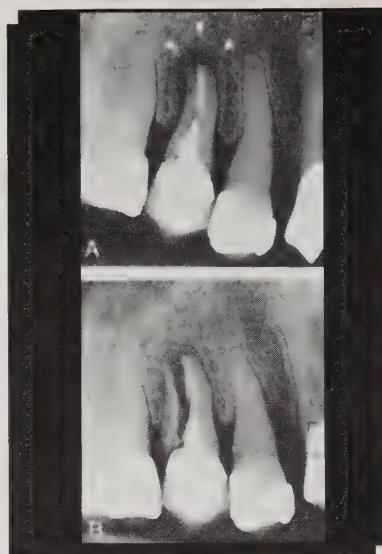


Fig. 5: Periapical radiographs of a post-reconstructed maxillary premolar. The halo-like radiolucency at the apex is characteristic of vertical root fractures (A). A delay in treatment occurred, and the radiograph taken four months later revealed complete separation of root segments (B).

cepted that once a vertical fracture has occurred, it becomes a source of chronic inflammation. Subsequently, and sometimes at surprising speed, the local disease process may lead to periodontal breakdown and the development of a periodontal pocket.⁷ These narrow periodontal pockets follow the root fracture's lines, and may extend along the full length of the fracture. The significance of the vertical fracture in the process of pocket formation is usually demonstrated by the normal sulcus depth found on either side of the pocket.¹⁵

To try and understand the destructive process that occurs along a vertical root fracture, it may be helpful to consider adjacent tissue reactions. For example, histological evaluations have shown that traumatic injury to the periodontal ligament, in the form of ruptured ligament fibres, will heal without pocket formation.^{1,18} Healing will also occur along horizontal root fractures that do not communicate with the oral environment.¹

Interestingly, periodontal regeneration studies have provided evidence that a new periodontal attachment with cementum and fibre insertion does not generally occur

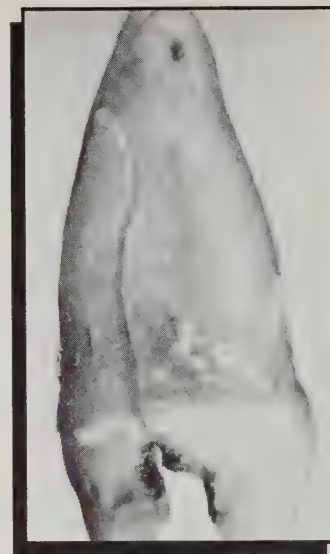


Fig. 6: A vertical root fracture is inaccessible to cleaning and may provide a path of entry for bacterial colonization, leading to localized periodontal breakdown.

on exposed dentin without cementum.¹⁹ This is characteristic of the surface found in the fracture line.

A critical factor in the development of a deep pocket is the extension of the gingival sulcus via the vertical fracture line. The extension creates a pathway through which oral microbial pathogens may enter, colonize the area, and cause the inflammation typical of bacterial infection in deep pockets (**Fig. 6**). This mechanism explains the common findings of chronic inflammation or abscess formation at the site of the fracture.

Prognosis and Treatment

The prognosis of horizontally fractured teeth depends on the relationship of the fracture to the gingival sulcus.¹ If the fracture is located below the alveolar crest, with no communication into the gingival sulcus, healing with hard tissue is possible. A conservative approach is advocated in these cases (for detailed treatment principles, see Andreassen et al, 1981 and 1993).^{1,2}

By comparison, the prospects for healing with calcified tissue are poor to none when the fracture line extends into the gingival crevice. Possible treatment in such cases includes the extraction of the

coronal fragment, followed by orthodontic extrusion or surgical crown lengthening of the remaining apical fragment.^{1,2}

In vertically fractured teeth, the tooth type, as well as the location and extent of the fracture, are important for the choice of treatment. Coronal fractures may extend apically beyond the cemento-enamel junction to the root surface in an angular fashion. If the apical extension of the fracture is minimal, the aim of treatment is to place the gingival margin apical to the level of the fracture. This can be successfully accomplished by a surgical crown lengthening procedure that includes the repositioning of the gingival margin, and possibly the remodelling of the alveolar bone crest. The surgical procedure may be sufficient in itself, or it may be combined with orthodontic extrusion of the fractured tooth.²⁰

Crown lengthening may result in a reduced crown-to-root ratio. However, it has become clear that in the presence of adequate plaque control, teeth with a reduced periodontium have a much better long-term prognosis than was earlier assumed, and may even serve as abutment teeth for fixed restorations.²¹

If a vertical fracture occurs in a multi-rooted tooth, the fractured root may be resected and the remainder of the tooth retained. Such root resection is used frequently as a treatment modality for periodontally involved multi-rooted teeth. Longitudinal studies of root-resected teeth have been very encouraging: 94 per cent of teeth were maintained for five years and 68 per cent for more than 10 years.^{22,23}

If resected teeth require extensive restorative procedures, special care should be given to the force dynamics. A major cause of failure for resected teeth is subsequent root fracture associated with restorations and posts.²² The fracture of restored, root-resected teeth may, in part, be explained by simulated dentin stress studies,⁵ which found that post-reconstructed teeth with diminished bone support have a greater potential for root fracture when more

than 4.0 to 6.0 mm of bone has been lost. As described previously, avoiding excessive dentin removal, and supporting the dentin with a metal coping, greatly reduces the risk of such fractures.¹³

Therefore, while root resection is often a viable treatment option, the strength of the remaining roots and the biomechanics of the restorations should be carefully considered to assure a good long-term prognosis.

Single-rooted teeth with advanced vertical root fractures usually have a hopeless prognosis, and must therefore be extracted. Unfortunately, eliminating the fracture leaves the remaining part of the tooth too compromised to allow for the subsequent restoration of the tooth.

A number of interesting alternative approaches have been attempted in the treatment of vertical fractures, as illustrated in the following case reports. However, these treatments generally have had questionable outcomes or poor long-term prognosis, and they should only be attempted with great caution.

Oliet²⁴ extracted three teeth with vertical root fractures, completed endodontic procedures extraorally, and cemented the segments with cyanoacrylate. The teeth were then reimplanted and stabilized. Sixteen months later, two of the teeth were still comfortable and functional, but their long-term prognosis was judged to be poor.

The removal of only one fragment is another option. In the case of an endodontically-treated mandibular incisor with a vertical fracture, the smallest fractured root segment was surgically removed along with root canal filling and granulation tissue.²⁵ Considerable bone fill as well as healing of the gingival tissues to the retained segment were observed initially, but long-term follow-up revealed deep pocketing and the reoccurrence of mobility. Modifying this approach, Vertucci²⁶ covered the exposed root canal filling of the retained root with an amalgam restoration, and treated the exposed root surfaces with a citric acid solution. At a three-year, postsurgical follow-

up, the tooth was judged to be functional with no clinical or radiographic evidence of a periodontal defect.

The healing response in young patients may provide a better chance for healing. Successful treatment of a vertical root fracture of a vital maxillary central incisor was reported in a nine-year-old boy after the fractured tooth segments were immobilized with close apposition of the fractured segments.²⁷

Differential Diagnosis

Several differential diagnoses, other than vertical root fracture, should be considered when a patient presents with an isolated periodontal pocket and non-specific symptoms.

It has become clear that periodontitis may manifest itself in isolated pockets, which can develop over relatively short periods of time.^{28,29} However, localized periodontal defects involving deep pockets may also develop over a short period along the grooves found in the root surface. The most common of these is the palato-radicular groove, which is usually found on the maxillary central and lateral incisors. This groove occurs at reported prevalences of up to 21 per cent for both maxillary incisors, and 14 per cent in lateral incisors alone.³⁰⁻³² The grooves form during tooth development and extend from the crown apically along the root to different levels. A normal periodontal attachment apparatus is seen in the groove.³¹ However, the retention of microbial dental plaque in these difficult to clean areas has been shown to be associated with an increased level of gingival inflammation and, at times, localized periodontal destruction.^{18,32}

Patients with advancing periodontal destruction along a palato-radicular groove typically will present with dull pain or discomfort in the area of the affected tooth. Similar to the findings associated with a periodontal abscess, the clinical examination may reveal gingival inflammation and a localized deep pocket corresponding to the palato-radicular groove, with bleeding or a

purulent exudate present. Radiographs may show a bony defect but the radicular groove is commonly not evident as it is masked by the facial surface of the root.

Isolated periodontal pockets have been found adjacent to enamel projections. Enamel projections extend into the furcation of 28.6 per cent of mandibular molars and 17 per cent of maxillary molars.³³ Since no connective tissue fibre attachment is present on the enamel surface, such projections have been suggested as predisposing factors to periodontal breakdown.⁴ However, in light of the high incidence of such projections relative to the number of teeth affected, this assertion has been questioned.

An isolated site of rapid periodontal breakdown has been reported along a cemental tear.³⁴ The cemental tear can occur either as a complete separation along the cemento-dentinal border, or as a partial split within the cementum. Its exact etiology is uncertain, but has been related to acute or functional trauma. Reported symptoms include dull pain adjacent to the affected tooth, inflamed gingiva associated with an isolated periodontal pocket, and possibly purulent exudate. Radiographs may demonstrate an osseous defect and a radiopaque "foreign body" if the separation is on a proximal root surface.³⁴

Endodontic pathology may affect the periodontium, leading to the formation of a localized periodontal defect. The capacity of several anaerobic bacteria, including black-pigmented bacteroides from the necrotic dental pulp, to induce purulent infections has been demonstrated experimentally.³⁵ It is known that bacterial infection of the necrotic pulp may produce periapical inflammation and subsequently an acute alveolar abscess. This abscess will most commonly form a sinus tract through the alveolar mucosa. Less frequently, exudate will drain through the gingival sulcus, forming a deep localized periodontal pocket that extends to the apex of the root.

The symptoms of acute lesions usually include pain, edema and erythema of the adjacent gingiva.³⁶

In chronic conditions, however, the symptoms experienced by the patient may be negligible. Radiographically, the tooth will show a widened periodontal ligament space and/or a radiolucent region around the apex of the affected tooth. As in any situation where a localized periodontal defect is detected, the pulpal condition must be carefully evaluated during examination. The pulpal reaction to electric or thermal vitality tests, and sensitivity to percussion, are key to confirming an endodontic etiology of periodontal lesions.³⁶

Accessory canals in teeth with necrotic pulps and endodontically-treated teeth also show some association with isolated periodontal pockets. In a study of persistent periodontal pockets associated with endodontically-treated teeth, it was found that the accessory canals contained remnants of necrotic pulpal tissue, bacteria and necrotic debris.³⁷ With accessory canals found at a prevalence of 23 per cent,³⁸ the elimination of all tissue remnants from the root canal system is essential for the healing of a combined periodontal-endodontic lesion.

Conclusions

This review of the current literature has revealed that while vertical root fractures tend to occur with more predominance in teeth of lesser physical strength, the majority of fractures follow the weakening of teeth by restorative procedures.

Establishing an accurate diagnosis for teeth with vertical root fractures represents a great challenge, because the same signs and symptoms are seen for other conditions. However, a careful clinical and radiographic examination may indeed show several coinciding symptoms that, taken together, are typical of a vertical root fracture.

On the basis of an accurate diagnosis, the clinician can establish a long-term prognosis and treatment plan. In teeth with early incomplete fractures and symptoms on function, but which otherwise display a normal pulpal response, crown placement may be successful in preventing further fracture progression. Superficial vertical root fractures in single-rooted

teeth, or vertical fractures in individual roots of molars, can be managed by surgical crown lengthening or root resection, respectively. The currently available treatments for advanced vertical root fractures in single-rooted teeth are inadequate, however, and extraction is generally unavoidable. A decision to treat a fractured tooth should include consideration of the expense involved, the strategic value of the tooth in the arch, and alternative restoration options to replace the tooth if it is extracted. ■

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Dr. Schettritt is in private practice, specializing in periodontics, in Montreal, Quebec.

Dr. Steffensen teaches graduate periodontics in the department of clinical dental sciences, faculty of dentistry, University of British Columbia.

Reprint requests to: Dr. B. Steffensen, Department of Clinical Dental Sciences, Faculty of Dentistry, University of British Columbia, 2199 Wesbrook Mall, Vancouver, B.C. V6T 1Z3.

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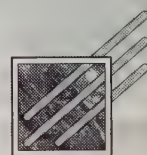
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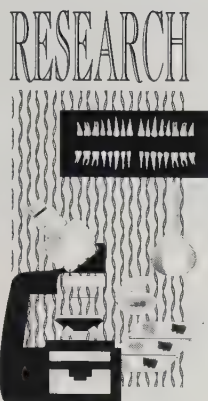
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Removable Partial Denture Design By Canadian Dental Laboratories: A Retrospective Study

Oskar Sykora, CDT, DDS, PhD

ABSTRACT

Identical, unilateral, distal extension base (DEB) maxillary and mandibular casts with a posterior modification area were mailed to 15 Canadian commercial dental laboratories. Each cast was accompanied by a letter explaining the purpose of the study and a request for the laboratory to design a RPD-U and RPD-L framework. The package also included a questionnaire on the techniques commonly used by dentists in the construction of a removable partial denture prosthesis, as well as the laboratory procedures they requested from laboratory technicians. Compared to the findings of previous studies by McCracken and others, the results of this study indicate an improvement in the dentists' understanding of the fundamental principles of an RPD framework design. However, the questionnaire also revealed the need for improved communication between the dentist and the technician. The study suggests that the basic principles for the construction and design of removable partial dentures, as taught in dental schools across Canada, must be respected by dentists.

SOMMAIRE

À quinze laboratoires dentaires commerciaux du Canada, on a posté des modèles d'étude de type selle libre unilatéral, du maxillaire supérieur et inférieur. Chaque

modèle était accompagné d'une lettre expliquant le but de l'étude et demandant au laboratoire de concevoir une structure pour des prothèses partielles amovibles supérieure et inférieure. Étaient joints à l'envoi un questionnaire sur les techniques généralement utilisées par les dentistes pour construire une prothèse partielle amovible, ainsi que les procédures de laboratoire qu'ils demandent aux techniciens d'exécuter. Comparés aux résultats des études faites auparavant par McCracken et d'autres chercheurs, ceux de cette étude-ci indiquent que les dentistes comprennent mieux les principes fondamentaux liés à la conception d'une structure pour une prothèse partielle amovible. Par ailleurs, le questionnaire a révélé que les communications entre dentiste et technicien ont besoin d'être améliorées. Enfin, l'étude suggère aux dentistes de respecter les principes de base liés à la conception et à la construction des prothèses partielles amovibles tels qu'on les enseigne dans les écoles de dentisterie au Canada.

Introduction

The increased delegation of work to commercial dental laboratories has led dentists to place greater reliance on the dental technician's knowledge. At the same time, however, the pros-

thetic literature reports wide variations in framework design, even on casts obtained from a single patient.^{1,2} There is also a dichotomy between the principles of removable partial denture preparation, as taught in dental schools, and the actual service being provided to dentists by dental laboratories.³⁻⁵

McCracken⁶ undertook the first survey to assess the designs of partial dentures fabricated by commercial dental laboratories in 1962, using the cast for a mandibular Kennedy Class II, modification 1, removable partial denture design. At the conclusion of his investigation, McCracken stated: "A study of maxillary removable partial denture designs is also worth considering, and it is hoped that this can be done."⁶

Sykora and Çalikkocaoglu⁷ undertook the hoped-for study in 1970, when they analyzed partial denture frameworks that had been fabricated by commercial dental laboratories using casts for a maxillary Kennedy Class II, modification 2, design.

In 1984, Taylor et al⁸ published the findings of their removable prosthodontic laboratory survey of commercial dental laboratories in the U.S. mid-western states. Their results indicated that most of the removable partial denture frameworks fabricated by the responding laboratories were designed by the dental technician, not the dentist.

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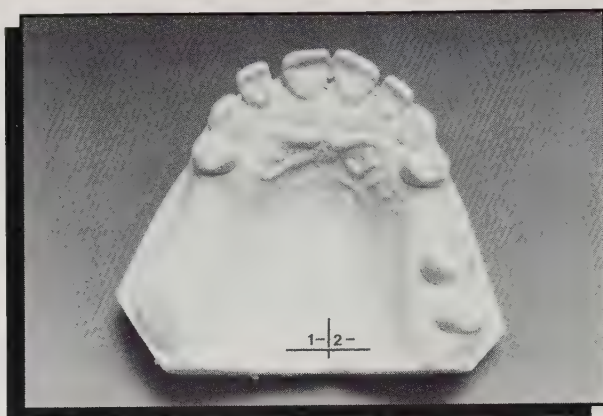


Fig. 1: Maxillary cast.

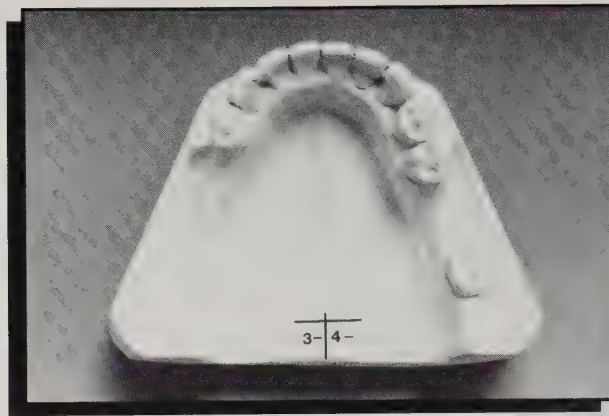


Fig. 2: Mandibular cast.

The principal goal of this new investigation was to determine whether communication between the dental office and the laboratory has improved in the more than 30 years since McCracken undertook his ground-breaking study. Other goals were to ascertain which techniques are most frequently used by dentists, which services they seek from technicians and, finally, if commercial dental laboratories have improved their knowledge of RPD framework design since 1962.

Materials and Methods

Identical maxillary and mandibular casts were mailed to 15 randomly-selected commercial dental laboratories located within major Canadian population areas in different regions of the country. The 30 casts each had a unilateral distal extension base with a posterior modification area.

The study's objectives were outlined in a letter that asked participating laboratories to design a RPD-U and RPD-L frame on the provided casts (Figs. 1 and 2). No other instructions accompanied the casts, but the letter made it clear that the remaining teeth were healthy and had adequate bone support.

Casts with partially edentulous areas were chosen for this study because of the inherent problem posed by the combined tissue and tooth-supported design of the distal extension base. The posterior modification area was totally tooth-supported, with a potential abutment tooth located anteriorly to the fulcrum line. Retentive areas on the potential abutment teeth

Table 1a and 1b

Selection of a Major Connector

a. Mandibular Design		b. Maxillary Design	
Lingual Bar	15	Palatal Strap	9
		Anterior & Posterior Palatal Bar	2
		Posterior Palatal Bar	1
		Anterior Palatal & Lingual Plate	1
		Rugae (Horseshoe) Type	2
Total No. of Casts	15	Total No. of Casts	15

were anywhere on the buccal surfaces of 1-4, 2-4, 2-6, 3-4 and 4-5. However, the mesially-inclined 4-7 abutment had retention mainly on its lingual and mesiobuccal (M/Bu) surfaces, without very much undercut on its distobuccal (D/Bu) surface.

The survey package included a questionnaire on the techniques that dentists usually used, as well as on how they communicated their requirements to the dental technicians. All 15 of the dental laboratories contacted at the outset of the study designed the maxillary and mandibular frameworks, but two laboratories did not return the questionnaire.

Results and Discussion

Major Connector Design

A lingual-bar type of major connector was incorporated in the design of all mandibular casts, since the position of the lingual frenum, lack of tori and depth of the floor of the mouth, as well as the health, number, location, and distribution of the remaining teeth, did not ne-

cessitate the selection of a lingual-plate major connector. In addition, given the patient's partially edentulous situation, the lingual bar could have been positioned well away from the tooth-tissue junction, and been made sufficiently wide for adequate strength.

There was a greater variety of major connector designs in the frameworks for the maxillary cast. In the majority of designs, the palatal strap was appropriately selected as the maxillary connector of choice. However, a few designs had a posterior and/or anterior palatal bar, or the rugae type of major connector, which would be contraindicated for a DEB design with no anterior modification area. Such designs could not take advantage of the additional support that can be obtained with a larger palatal strap design. Also, the rugae area should be left free of framework interference to the patient's tongue.

A summary of the mandibular and maxillary major connector designs seen in this study is given in Tables 1a and 1b, respectively.

Table IIa and IIb

The Selection of Tooth Support: The Placement of Occlusal Rests

a. Mandibular Design			
Abutment Tooth	3-4*	4-5	4-7
Mesial Rest	12	4	9
Distal Rest	1	8	1
Mesial & Distal Rest	2	3	5
Total No. of Casts	15	15	15

*Distal extension base abutment tooth

b. Maxillary Design			
Abutment Tooth	1-4*	2-4	2-6
Mesial Rest	5	2	2
Distal Rest	4	10	—
Mesial & Distal Rest	6	3	13
Total No. of Casts	15	15	15

*Distal extension base abutment tooth

The Placement of Occlusal Rests

Support can be defined as a resistance of the RPD to the vertical masticatory forces in the direction of the basal structures. Thus, particularly on a mandibular DEB design, the proper placement of the rests is important for the stability of the prosthesis, and for the periodontal health of the abutment teeth.

Appropriately, most of the mandibular designs included a mesio-occlusal rest for the DEB 3-4 abutment. However, there was less unanimity in the placement of the occlusal rest on the abutments adjacent to the 4-6 modification area. In such a tooth-borne situation, the ideal placement of an occlusal rest is adjacent to the missing tooth or teeth. Thus, the 4-5 abutment would have a disto-occlusal rest, while the 4-7 would be designed with a mesial one. The majority of designs had a distal rest on the 4-5 and a mesial rest on the 4-7 abutment. However, many designs had a mesial and a distal rest on the 4-7 abutment. This tooth had a slight mesio-lingual inclination, which may have influenced this choice of a double rest. The placement of the mandibular rests are summarized in **Table IIa**.

All of the maxillary DEB abutment 1-4 designs had some occlusal rests appropriately placed on the mesio-occlusal surface of this abutment. However, a considerable number of designs selected both a mesial and distal rest — a less desirable alternative. On the tooth-borne posterior modification area of 2-6, the rest placement of choice on the 2-4 and 2-7 abutments was adjacent to the missing 2-6. The majority of designs fulfilled this requirement, although many also included an unnecessary distal rest in conjunction with a mesial rest on 2-7. **Table IIb** presents a summary of the placement of the maxillary rests.

The Placement of Indirect Retainers

A unilateral DEB design requires an indirect retainer. It should be placed as far anteriorly from the line of rotation as feasible to stop the DEB from lifting away from the supporting tissue.

In the maxillary design, the placement of choice for indirect retainers was the 2-4 abutment. The placement of choice in the mandibular design would be the 4-5, 4-4 or the 4-3. All of the designs submitted in this study had indirect retainers placed on the appropriate abutments. However,

without exception, a direct retainer was used on 2-4 and 4-5 to fulfil this role and provide additional direct retention. All the maxillary designs, except the one for cast number 3, had a cast retentive arm. The design of cast number 3 included a horizontal wire retentive arm on the 2-4 abutment.

Similar observations were made with the mandibular designs. The number 3 and 5 casts were designed with wire retentive arms on the 4-5 abutment, but all the other designs had cast retentive arms. It is the author's belief that a wire retentive arm placed anterior to the fulcrum line will always be kinder to an abutment tooth than a cast retentive arm. This is particularly true for a mandibular DEB design with a lingual bar. During mastication, the DEB will move toward the underlying tissue and the framework will rotate along the fulcrum line. This is of relatively lesser concern in the maxilla, where additional support can be obtained from the palate with a large palatal strap or a palatal base. Nevertheless, even in this type of situation, a wire retentive arm is considered kinder to the abutment tooth because it is less torquing.

The Placement of the Retentive Components

The stability of an RPD also depends on the retentive factor, which is influenced by the selection and placement of the retentive arm of a direct retainer. The selection of retentive areas for the main abutment teeth is summarized in **Tables IIIa and IIIb**.

Mandibular Design:

The retentive arms for the 3-4 distal extension base abutment tooth must be designed with particular care to minimize potential torque. In order of choice, therefore, the "I" bar, with its retentive tip at the greatest convexity, a wire circumferential arm engaging the mesial, or a cast arm engaging the distal retentive area, would therefore be the preferred components. The majority of designs fabricated for this study featured the proper "I" bar or the retentive wrought

Table IIIa

The Selection of Retentive Areas on the Main Abutment Teeth — Mandibular Design

Abutment Tooth	3-4*	4-5	4-7
Mesial Buccal Retention			
Cast circumferential arm	1	5	—
Wire circumferential arm	2	2	—
Back-action arm	—	—	6
Hair pin arm	—	—	1
Ring clasp	—	—	2
"T" bar	—	—	1
Buccal retention			
"I" bar (greatest convexity)	6	3	—
Distal Buccal retention			
"I" bar	1	—	—
"C" bar	1	—	—
Back-action arm	1	2	1
"T" bar	—	1	—
Cast circumferential arm	—	1	2
Distal Buccal & Mesial Buccal Retention			
"T" bar	3	1	—
Mesial Lingual Retention			
Back-action arm	—	—	1
Distal Lingual Retention			
Cast circumferential arm	—	—	1
Total No. of Casts	15	15	15

* Distal extension base abutment tooth

wire arm design, but the "T" bar appeared to be the retentive arm of choice in a few other designs. If the "T" bar's retentive portion had been confined to the disto-buccal surface of the abutment, these designs could have been acceptable as well. However, without exception, all of the "T" bar arms engaged both the distal and the mesio-buccal retention area. This type of clasping is too rigid for a DEB abutment tooth. Fortunately, the cast circumferential arm engaging the mesio-buccal undercut — once the most commonly-used design, but now considered too rigid for a DEB abutment — was selected by only one laboratory.

The 4-5 abutment did not need a retentive component. In fact, because of its location anterior to the fulcrum line, the relatively rigid cast retentive arm would be con-

traindicated, particularly for a mandibular design. Under a vertical chewing pressure, the DEB is compressed onto the mucosa, and a 4-5 abutment with a cast retentive arm on its buccal surface would be subjected to a potentially damaging stress. This would be particularly true if the RPD's DEB was under extended, the altered cast technique was omitted, or the patient did not return for a recall when a relining was necessary to re-establish the DEB tissue support.

In an ideal design, a wire retentive circumferential arm would have been the proper choice because of its inherently greater flexibility relative to a cast retentive arm. However, the more rigid cast circumferential or the "T" bar appeared to be the choice in many designs.

A great variety of designs were observed for the retentive arm of the 4-7 abutment, which may be explained by the fact that, due to the mesial tilt of the abutment, there was very little retentive area on the D/Bu surface of the molar. Many of the designs selected the more difficult to reach M/Bu area, using a back-action clasp, for example. The easier to reach lingual retentive area was selected by a minority of designs.

Maxillary Designs:

The same design principles applied to the DEB 1-4 abutment and to the mandibular DEB 3-4 abutment. There was no discernible pattern in the retentive arms used for this abutment. Some designs correctly used an "I" bar or a wire retentive arm, but many opted for the rather rigid, cast circumferential arm engaging the M/Bu under-

Table IIIb

The Selective of Retentive Areas on the Main Abutment Teeth — Maxillary Design

Abutment Tooth	1-4*	2-4	2-6
Mesial Buccal Retention			
Cast circumferential arm	4	8	1
Wire circumferential arm	3	1	—
Back-action arm	—	—	1
Buccal Retention			
"I" bar (greatest convexity)	3	2	—
Distal Buccal Retention			
Back-action arm	1	2	1
"T" bar	1	—	—
Cast circumferential arm	—	1	12
Distal Buccal & Mesial Buccal Retention			
"T" bar	3	1	—
Total No. of Casts	15	15	15

* Distal extension base abutment tooth

cut. Only one "T" bar design correctly engaged the D/Bu undercut. All the other T-bar designs engaged both the M/Bu and the D/Bu undercuts, making the retentive arm too rigid for a DEB abutment.

Without the use of a retentive arm, the 2-4 abutment could have only been employed as an indirect retainer. However, all submitted designs used a retentive arm on this abutment. The cast circumferential retentive arm engaging the M/Bu undercut was the most popular choice.

There was little disagreement in the choice of a retentive arm on the 2-7 abutment. The cast circumferential arm was properly selected by most respondents, but two laboratories selected, quite unnecessarily, a back-action design.

Questionnaire

As expected, the question on the percentage of work authorizations for an RPD framework considered by dental technicians to lack adequate information solicited a variety of responses, with answers ranging from five to 75 per cent. Communication between the dental office and the dental laboratory still appears to be a major problem for many dental technicians. This is not a new problem. Henderson^{9,10} published in-depth discussions on the writing of

work authorizations for removable partial dentures as early as 1966 and on the lack of communication with dental technicians in 1970. In his 1978 study on the "Extracoral removal partial denture service in Canada," Sykora¹¹ reported that the most revealing response was the complaint from commercial dental laboratories about the lack of detailed instruction they received from dentists in regards to the fabrication of removable partial denture frameworks. However, it is of interest to note that many dentists also felt that "the dental lab doesn't give me what I ask for."¹²

Although custom-made, acrylic resin impression trays are preferable for a framework impression, and this procedure is taught in Canadian dental schools, the responses to this survey indicate that only a few dentists actually use them — from a high of 80 per cent to a low of zero per cent.

In 1984, Taylor⁸ reported that "most master casts do not exhibit adequate tooth preparation," and, "in many circumstances, dental technicians felt that rest preparations and guide planes are inadequate or absent from the master cast." Similarly, at the 1976 International Symposium on Removable Partial Dentures in Cardiff, Wales, Sykora¹¹ stated that al-

though all Canadian dental schools teach the principles of prepared guiding planes and rest preparations, data from commercial dental laboratories indicated that a considerable percentage of direct retainers were constructed on unprepared tooth surfaces.

It is disconcerting that so little progress has been made over the years. As early as 1951, Steffel¹³ stated: "The step-in clasp partial denture procedures most often neglected or omitted altogether are the preparation of the mouth, or alterations, before making final impressions...preparing rest areas with positive seats..."

Similarly, in 1995, some master casts do not have clearly defined rest seats and/or guide planes. In this study, the percentage of master casts where the technician could clearly see and use prepared rest seat areas ranged from a low of 20 per cent to a high of 99 per cent. The percentage of master casts on which the technician could clearly see and use the prepared guide planes was considerably lower, ranging from eight to only 75 per cent. Many laboratories reported that they never mount master casts on an articulator prior to the fabrication of a framework (question 5, **Table IV**).

Table IV

Results of Questionnaire Sent to Laboratories/Response % of Laboratories 1-15

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12*	#13*	#14	#15
1. What percentage of submitted work authorizations for a RPD framework are without adequate information and may require a call to the submitting dentist?														
10	10	20	70	65	10	40	55	75	5	75	—	—	10	20
2. What percentage of framework impressions received are made in a custom tray?														
80	35	0	60	0	80	45	30	20	40	50	—	—	80	0
3. What is the percentage of master casts where you can clearly see and use prepared rest seat areas?														
50	99	90	60	65	30	90	30	20	80	20	—	—	80	90
4. What is the percentage of master casts on which you can clearly see and use prepared guide planes?														
10	15	10	10	40	20	30	20	8	75	20	—	—	70	75
5. What percentage of master casts are mounted prior to frame fabrication?														
5	20	5	80	20	40	50	50	50	90	80	—	—	10	95
6. What is the percentage of lower distal extension/free-end saddles made without an altered cast technique?														
99	80	95	80	85	10	80	90	99	85	99	—	—	95	90
7. What percentage of stone is normally used for the master cast? a) Budd stone														
50	10	20	40	80	80	60	80	50	90	50	—	—	5	0
7. What percentage of stone is normally used for the master cast? b) Improved stone (i.e. Velmix)														
50	90	80	60	20	20	40	20	50	10	50	—	—	95	100
8. What percentage of frames fit well on the master cast but require remake due to poor intraoral fit?														
10	6	5	10	8	5	5	5	10	10	10	—	—	4	15-20
9. What percentage of frameworks are designed by the laboratory at the dentist's request?														
30	0	15	25	75	85	50	30	60	50	60	—	—	30	40
10. What is the percentage of tripoded master casts which are received by your laboratory from the dentist?														
5	30	5	1	3	5	10	10	0	20	1	—	—	5	5
11. What percentage of designs are outlined by the dentist on a study cast and are enclosed with the work authorization?														
20	75	10	5	10	5	10	20	60	20	5	—	—	10	20

* No reply to the questionnaire.

The use of the altered cast technique, or rather its lack of use by dentists, was also confirmed (question 6, **Table IV**), with the majority of dental technicians reporting that this technique is seldom, if ever, requested. This confirms the findings of previous investigations.^{5,8,9}

The ordinary, Type III, buff stone still appears to be used in the construction of a master cast. However, it is encouraging to note that many laboratories now use an improved, Type IV or V hard stone, such as Velmix (Columbus Co.) or DieKeen (Kerr Co.).

A small percentage of frameworks that fit well on the master cast, but require a re-make due to

a poor intraoral fit, was reported by the respondents. It is impossible to ascertain the reason for this problem, as it could be traced to a variety of clinical or laboratory mistakes.

Question 9 (**Table IV**) asked technicians for the percentage of frameworks that are designed by the laboratory at the dentist's request. It solicited several interesting responses. Some laboratories reported that dentists would routinely ask the technician to design the framework.

Steffel,¹³ in 1951, stated that "nothing can supersede good judgment, coupled with a knowledge of basic principles. Many

dentists use snap judgment in the application of these fundamental principles; or even worse, they send restorations to a remotely located dental laboratory which makes up a run of the mill appliance based solely on mechanics. The results are devastating to the teeth, soft tissue, and osseous structures." Similarly, in 1962, McCracken,⁶ in his pioneering article on the "Survey of partial denture designs by commercial dental laboratories," stated that the "delegation of the treatment plan and design of removable partial dentures to the commercial dental laboratory is strongly condemned."

In the United States, when Taylor et al,⁸ more than 20 years after McCracken, asked what percentage of frameworks are designed by a technician at the dentist's request, 77.9 per cent of responding dental technicians reported that they "designed most or all of the removable partial dentures fabricated in their laboratories." It is satisfying to note, however, that most Canadian laboratories reported that only an insignificant number of dentists still delegate the responsibility for framework design to technicians.

Question 10 (Table IV) sought information on the percentage of tripod master casts that commercial dental laboratories receive from the dental office. According to the replies, very few dentists tripod the master cast to indicate the desired path of insertion and removal for the framework to the technician.

Question 11 (Table IV) asked participants about the percentage of dentists who outline the design on a diagnostic cast (or a second-pour master cast), and enclose the outline with the work authorization. It is encouraging to note that many dentists, according to the laboratory replies, took the time to outline the requested framework design. However, even here, the range fell rapidly from the high of 75 per cent to just 20 per cent and below.

Conclusion

Compared to McCracken's 1962 reports on mandibular removable partial denture designs, and the maxillary design reported by Sykora and Çalikkocaoglu in 1970, the present results indicate a marked improvement in the understanding of the fundamental principles of partial denture design. However, the questionnaire results reveal only a small improvement in communication between the dental office and the dental laboratory. The need for dentists to understand the basic principles for the construction and design of a removable partial denture, as taught in dental school, and to carry these principles into their general practice, is as valid today as it was years ago. ■

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Dr. Sykora is professor of prosthodontics, faculty of dentistry, Dalhousie University.

Reprint requests to: Dr. Sykora, Faculty of Dentistry, Dalhousie University, Halifax, Nova Scotia B3H 3J6.

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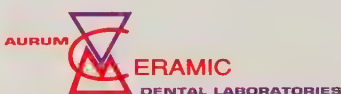


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L'infection virale herpétique : de la primo-infection buccale à l'herpès récidivant

Isabelle Lacroix, DMD

Christiane Mascrès, DrCD, PhD

SOMMAIRE

Cet article présente un aperçu des conditions cliniques dans lesquelles apparaît une lésion herpétique au moment de la primo-infection, en tant que primo-infection vraie ou premier accident herpétique, et au cours des récides. On décrit en détail le virus responsable, son anatomie et son fonctionnement. On aborde également l'étiologie et la transmission de l'infection virale herpétique, son évolution et ses complications, ainsi que les aide-diagnostic qui permettent de poser un diagnostic différentiel. Enfin, pour compléter l'approche de cette maladie chronique aux désagréments aigus, on parle de son traitement, surtout chez l'enfant, et on offre des suggestions pour la prévenir.

ABSTRACT

This paper presents an overview of the clinical conditions associated with a herpetic lesion at the time of the primary infection, as a true primary infection or a first herpetic accident, or during recurrences. The virus responsible, its anatomy and its functioning are detailed. The etiology and transmission of herpetic viral infection, its evolution and complications, as well as diagnostic aids are also discussed. To complete the discussion of this chronic disease, which can cause acute annoyances,

treatment, particularly for children is reviewed, and suggestions are made to prevent it.

Les infections herpétiques sont parmi les maladies virales les plus communes.¹ En effet, à l'âge adulte, au moins 90 p. cent de la population présente l'évidence sérologique d'une exposition passée au virus Herpes simplex (VHS) de type 1, et/ou de type 2, parfois appelé «virus de l'herpès humain» (VHH).² On détecte ainsi la présence d'anticorps anti-VHS chez 90 p. cent de la population à l'âge de 60 ans.³

Cependant, la majorité des patients exposés sont asymptomatiques,¹ puisque la primo-infection au VHS de type 1 ou de type 2 est asymptomatique chez 88 à 99 p. cent des enfants contaminés.⁴

Cet article a pour but de mettre en évidence le comportement souvent inattendu du virus, ses expressions cliniques possibles, et la meilleure façon de composer avec les signes cliniques de l'infection ou de ses récides, incluant prévention et traitement.

Identité du virus

Le virus Herpes simplex (VHS) appartient à la famille des Herpes viridae qui inclut aussi le cytomégalo-virus, le virus Epstein-Barr et le virus varicelle-zona (VVZ). Il se présente sous deux types distincts, définis en 1967 par Dowdle : le type

1 et le type 2.¹ Le VHS de type 1, qui est le plus fréquent puisqu'il est responsable de 78 p. cent des infections herpétiques,⁴ est plus souvent associé aux lésions oculaires et oro-faciales. Dans le cas où la bouche est impliquée, la primo-infection se révèle habituellement sous la forme d'une gingivo-stomatite herpétique primaire,³ avec des signes cliniques aigus.²

Le type 2 est plus souvent responsable des infections génitales et néonatales.^{2,5} Cependant, si la cible clinique classique est «au-dessus de la ceinture» pour le type 1, et «au-dessous de la ceinture» pour le type 2, elle peut se voir inversée et le VHS de type 2 devenir responsable d'une infection buccale.⁵

Cette versatilité dans la topographie de l'atteinte clinique s'explique par l'identité morphologique des deux types de virus qui ont approximativement 50 p. cent de leur acide désoxyribonucléique (ADN) similaire, ce qui les rend indistinguables au microscope électronique.^{1,2} Leurs différences que nous n'aborderons pas ici, se situent au niveau de leur génome, de leur biochimie et de leur biologie.¹

La prévalence du taux de VHS de type 2 reste cependant fonction de la maturité et de l'activité sexuelle de l'individu,² ce qui empêche les types 1 et 2 d'être rigoureusement interchangeables.

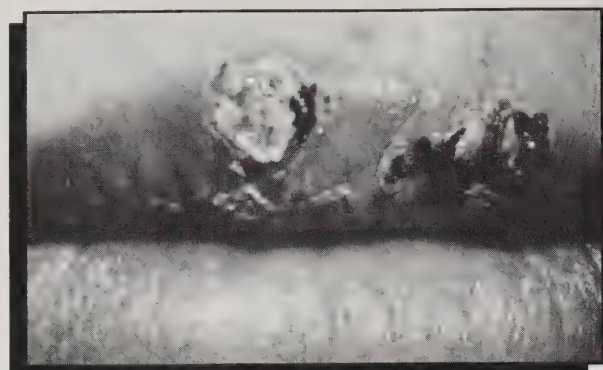


Fig. 1A : Allure d'un premier épisode d'herpès labial chez l'enfant. Les lésions sont en phase de guérison, déjà recouvertes d'une croûte.

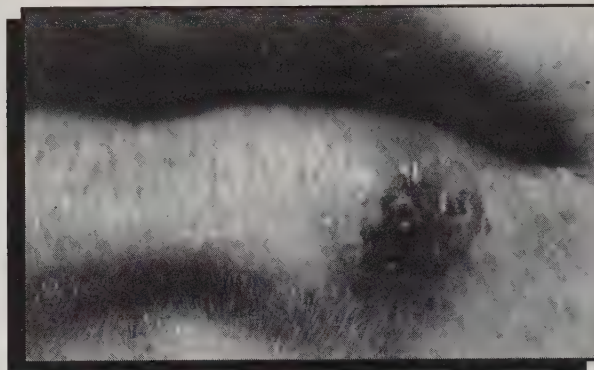


Fig. 1B : Allure d'une récurrence labiale, plus discrète chez l'enfant.

Manifestations cliniques du virus

Il existe deux manifestations cliniques majeures provoquées par le VHS : le premier épisode et la récurrence.

Le premier épisode lui-même peut s'assimiler d'une part à une primo-infection vraie, chez le sujet sain et jusqu'à présent séronégatif.⁵ Dans 80 à 90 p. cent des cas, l'infection reste asymptomatique.² Lorsqu'on signale un tableau clinique, on observe en général une gingivo-stomatite herpétique qui est le siège le plus commun habituellement décrit chez l'enfant.^{1,6}

D'autre part, le premier épisode peut ne pas être une primo-infection au sens propre, si le sujet est déjà séropositif mais porteur silencieux. On observe dans ce cas une explosion de signes cliniques chez un sujet préalablement insidieusement contaminé, lorsque le virus est finalement activé.

Enfin, la récurrence s'observe par réactivation virale. Pendant la primo-infection, le virus se multiplie, puis migre le long des nerfs jusqu'aux ganglions sensoriels où il demeure latent. Il peut se réactiver spontanément, ou par l'intervention de stimuli réactivants, comme le soleil, les menstruations, un traumatisme physique, un stress émotionnel, une fièvre, un épisode d'immuno-suppression etc. Il migre alors en périphérie et se multiplie de nouveau en provoquant une crise clinique douloureuse.

La **Fig. 1** présente l'allure d'une récurrence labiale (**Fig. 1B**), comparée à un premier épisode (**Fig. 1A**), chez l'enfant.

Primo-infection herpétique

On l'observe rarement avant six mois car l'enfant serait pendant cette période encore protégé par les anticorps maternels.⁷ Pour d'autres auteurs cependant, les anticorps maternels transmis passivement ne protégeraient pas le nouveau-né de l'herpès.¹ On a rapporté par exemple, le cas d'un nouveau-né décédé d'un herpès néo-natal à l'âge de huit jours, mais néanmoins aucun cas d'infection herpétique fatale n'a été signalé après l'âge d'un an.⁶

Avec une variabilité selon les auteurs, la primo-infection s'observe donc de deux ans à neuf ans.^{2,6,8}

Dans 50 p. cent des cas, le pic d'âge de l'incidence de la primo-infection se situe entre six et 24 mois, alors que les symptômes cliniques s'observent davantage de trois mois à 12 ans (avec une moyenne d'âge de 34 mois).⁴

Plus de 70 p. cent des enfants de 14 ans présentent une évidence sérologique de VHS de type 1, c'est-à-dire des anticorps circulants anti-VHS de type 1.²

Lorsqu'elle est symptomatique, la primo-infection herpétique se présente sous forme d'une gingivo-stomatite dans 92 p. cent des cas. Elle peut parfois s'accompagner de lésions génitales et cutanées.

Les critères confirmant une gingivo-stomatite aiguë primaire sont bien définis : on ne signale pas d'infection antérieure au VHS, et la période prodromique est suivie de l'apparition d'un énanthème accompagné de fièvre.⁸

L'incubation peut durer de un à 26 jours, en moyenne de une⁵ à deux semaines.¹ La durée de la première crise clinique est d'environ 21 jours, et les virus se multiplient et se répandent dans les tissus pendant 15 à 16 jours.

Au cours du prodrome, des maux de tête, des myalgies et de l'asthénie, de la fièvre pouvant atteindre 40°C, et de l'irritabilité, sont de règle.

La gingivo-stomatite herpétique se caractérise par des vésicules intra-épithéliales respectant la membrane basale. Ces vésicules s'effondrent rapidement en formant des ulcères sanguinolents à bords érythémateux, recouverts d'un enduit nécrotique blanc-gris (**Figs. 2A et 2B**).^{2,3,11} Des grappes de vésicules peuvent confluer pour former des lésions plus larges (**Fig. 3**). Les vésicules qui s'ulcèrent, s'observent sur la langue (**Figs. 2, 3 et 4**), le palais dur et mou, les lèvres (**Figs. 1A, 2, 3 et 5**), la gencive (**Figs. 4 et 5B**), la muqueuse buccale, et parfois le pharynx.^{1,2}

Lorsque la gingivo-stomatite herpétique se déclare, des lymphadénopathies douloureuses sont de plus observées.^{1,2} Les ulcères omniprésents produisent une douleur extrême. Les gencives saignent. L'enfant ne peut plus ni manger ni boire, ce qui provoque une déshydratation nécessitant souvent son hospitalisation.⁸

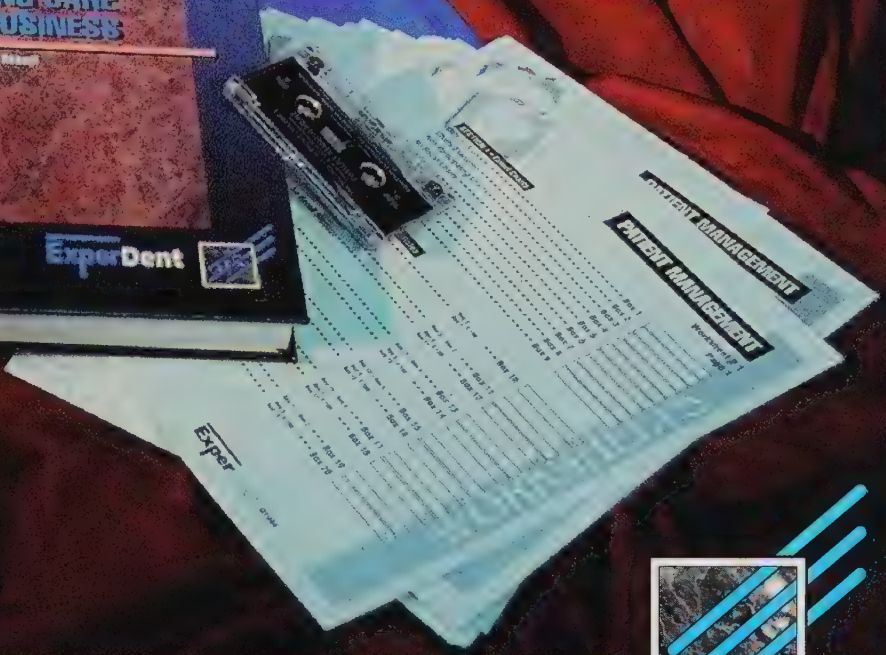
Chez le jeune adulte, la gingivo-stomatite peut s'associer à une pharyngite douloureuse avec des lésions exsudatives et ulcéreuses au niveau du pharynx, des amygdales et de la muqueuse buccale.¹



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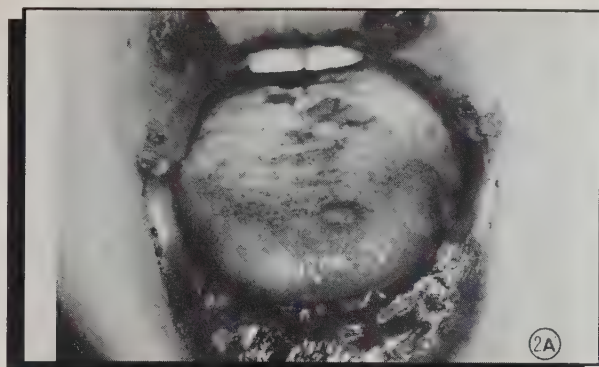


Fig. 2A : Primo-infection herpétique caractérisée. La langue est recouverte d'ulcères à bords érythémateux. Importantes lésions labiales avec croûtes.

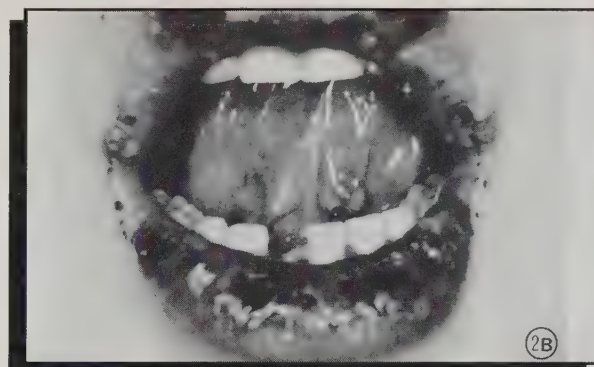


Fig. 2B : Vue ventrale de la langue présentant des ulcères du même type.

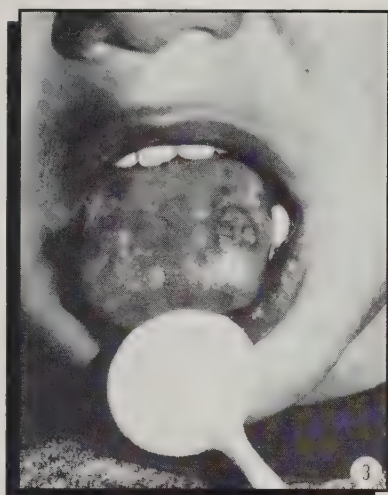


Fig. 3 : Des bouquets de vésicules herpétiques ont conflué pour donner des ulcères plus larges.



Fig. 4 : Les vésicules ulcérées s'observent sur la langue. La gencive présente des ulcères et des hyperplasies turgescents.

Le degré de sévérité dépend du taux d'anticorps et de l'âge du sujet. Lorsque l'herpès se déclare chez l'adulte, les symptômes sont souvent plus sévères.^{3,4} D'autre part, les patients qui souffrent de dermatite atopique ou qui sont immuno-déprimés, peuvent présenter de sévères infections oro-faciales, comme de l'*eczéma herpeticum* qui affecte de larges zones de peau et s'associe à des lésions viscérales.⁹

Anatomie et fonctionnement du virus

Le virion herpétique mesure 250 nm et consiste en un noyau d'acide désoxyribonucléique (ADN), une capside icosahédrique (20 facettes triangulaires, 12 sommets et 3 axes de symétrie), qui contient 162 capsomères et une enveloppe.

Entre la capside et l'enveloppe, se trouve un tégument constitué de protéines fibreuses. L'enveloppe elle-même est dérivée de la membrane de la cellule-hôte, modifiée au moment où la capside contenant de l'ADN pénètre par effraction dans le noyau hôte. Cette enveloppe est constituée de glycoprotéines qui permettent au virus de traverser la membrane cellulaire, puis aident à son attachement à la cellule-hôte. Elles contribuent aussi à fabriquer de nouveaux virions et permettent au VHS de diffuser de cellule en cellule.

Pour que s'effectue la réplication virale, le génome doit être transporté jusqu'au noyau à partir de la surface de la cellule. Après leur transcription dans le noyau, les acides ribonucléiques messagers (ARNs m) migrent dans le cytoplasme dont les protéines sont traduites en protéines virales. Les protéines ainsi produites re-

tourne au noyau où l'ADN se reproduit et les capsides se réassemblent. Les particules virales sont ensuite expulsées par endocytose inversée, dans les espaces extracellulaires où elles se disséminent en deux à trois jours au niveau d'un dermatome entier.

La réplication du virus au niveau du site d'inoculation produit des lésions herpétiques typiques. De plus, un mouvement viral s'effectue le long des nerfs où une latence virale peut très tôt s'établir. Le virus se rend aux terminaisons nerveuses sensorielles où se trouvent des récepteurs viraux spécifiques, et ils pénètrent l'axone nerveux au moment de la réplication.

Le processus de réplication virale conduit dans tous les cas à la mort de la cellule-hôte, sauf au niveau des neurones. Les virus peuvent donc alors se déplacer par dissémination axonale rétrograde



Fig 5A : Lésions labiales d'une primo-infection herpétique.



Fig. 5B : Le même patient, bouche semi-ouverte découvre une gingivite herpétique avec ulcères.

jusqu'aux ganglions sensoriels où ils demeurent latents. La réactivation virale s'observe même chez une personne dont le système immunologique est normal, aux mêmes sites anatomiques que la lésion primaire. Le niveau des anticorps neutralisants devient alors plus élevé qu'au cours de la primo-infection. La réactivation est souvent provoquée par un épisode de stress physique ou émotionnel, comme on l'a déjà signalé.¹

Étiologie et transmission

Les infections au VHS n'ont pas de variations saisonnières. Elles peuvent donc apparaître à n'importe quel moment de l'année, aussi bien chez la fille que chez le garçon. La transmission peut se réaliser à partir d'un individu symptomatique ou asymptomatique, à un individu génétiquement susceptible.² Dans le cas de stomatite herpétique récidivante, les patients ont présenté plus de lésions chromosomiques réparées, ce qui pourrait indiquer au départ une vulnérabilité génétique.¹⁰

Il n'est pas toujours facile de détecter le mode de transmission de la maladie. Une étude portant sur une période de dix ans, pendant lesquels 4 000 patients ont été examinés dans un service pédiatrique de dermatologie, a conclu que 50 cas seulement avaient réuni les critères d'une primo-infection herpétique vraie. Le mode de transmission a pu être spécifié dans seulement 40 p. cent des cas, ce qui confirme indirectement le rôle des porteurs asymptomatiques dans la transmission de l'herpès. On a observé en effet

qu'un quart des individus avec des anticorps anti-VHS¹ excrétaient sporadiquement des virus.

Lorsqu'on avait pu détecter son origine, la primo-infection avait été transmise par la mère atteinte d'un herpès labial récidivant (24 p. cent des cas), ou par un proche ou un membre de la fratrie souffrant aussi d'herpès labial. Le contact direct avec une ulcération, la salive, des gouttelettes provenant du naso-pharynx, l'usage commun des ustensiles de cuisine ou de toilette, sont souvent responsables de la transmission du virus de type 1.⁴

Le lait maternel peut lui-même être contaminé et transmettre le virus au nourrisson. Les lésions adoptent alors une localisation atypique et apparaissent au palais mou et au pharynx. À l'opposé, un enfant peut contaminer sa mère. Par exemple, un enfant de cinq ans avait contaminé son frère de 15 mois encore allaité. La mère présenta ensuite des vésicules herpétiques aux mamelons.⁶

Bien que chez l'enfant la plus grande incidence de l'infection herpétique de type 1 soit oro-labiale, le virus de type 2 peut dans des cas plus rares être détecté chez des sujets avec ce type de primo-infection. La transmission se fait selon un mode identique, soit à partir d'un herpès labial récidivant, soit à partir d'une gingivo-stomatite primaire chez un proche.

Il n'est pas exclu qu'un enfant avec une gingivo-stomatite oro-labiale s'autocontamine génitalement par contact du virus sur une muqueuse génitale excoriée ou rendue susceptible par un frotte-

ment mécanique préalable. Ce type de transmission est bien sûr non vénérien.

On peut enfin observer des lésions bipolaires impliquant la cavité buccale et la peau, signalées par une gingivo-stomatite et un panaris herpétiques. En effet, les lésions cutanées atteignent les mains dans 32 p. cent des cas, bien qu'on puisse les retrouver dans la région de la tête et du cou, et du tronc et des fesses,⁴ en particulier dans le cas d'«herpès du lutteur» inoculé par traumatisme.⁹

Évolution et complications

On peut donc considérer que le virus de l'Herpes simplex engendre une maladie chronique avec des périodes de latence et de réactivation du virus.⁵ La famille de l'Herpes viridae a en effet la propriété unique d'établir un état de latence chez l'hôte infecté. Comme on l'a vu, de nombreux stimuli d'origines diverses peuvent réactiver le virus latent dans le ganglion trigéminal et provoquer une récurrence clinique, habituellement au site de la primo-infection.² Dans la sphère oro-labiale, la récurrence est d'environ deux à trois fois par an (Corey). Elle peut atteindre 30 p. cent des patients qui ont présenté une gingivo-stomatite primaire. La récurrence se situe alors plus souvent sur la lèvre, et plus rarement sur la gencive attachée ou sur la muqueuse du palais dur.³

Le premier signe de réactivation du virus est une sensation prurigineuse de picotement et de brûlure. Vingt heures après ce prodrome, apparaît un bouquet de vésicules

qui se rompent et laissent une zone érosive. La guérison apparaît dans les sept à dix jours,³ ou après 10 à 14 jours selon les auteurs,² en passant par une croûte qui ne laisse pas de cicatrice.²

Au cours des récurrences, le niveau des anticorps neutralisants est plus élevé qu'au cours de la primo-infection. Des complexes immuns se forment et deviennent actifs dans l'induction, par exemple, d'un érythème multiforme qu'on peut rencontrer comme complication chez des patients qui récidivent.

Le premier déficit immunologique atteint les lymphocytes T «helper» détruits par le virus. Pendant les récurrences, les unités virales spécifiques de ce type de cellule sont en effet activées contre elles. La guérison de la primo-infection herpétique et des récurrences dépend essentiellement de l'état de cette immunité cellulaire. Dans le cas où cette barrière devient défaillante, comme lorsque le patient est atteint de tumeur maligne ou de SIDA, l'infection herpétique est alors sévère ou disséminée aux muqueuses et à la peau. La guérison devient alors aléatoire.¹

Ce sont les caractéristiques immunologiques de l'infection herpétique qui peuvent orienter plus sûrement son diagnostic.

Diagnostic et aide-diagnostic

L'observation des caractéristiques cliniques apparentes et l'histoire d'un contact avec une personne infectée peuvent suffire au diagnostic. Celui-ci peut être confirmé par une culture de virus qui demande un minimum de 24 heures,^{3,8,11} et par l'observation de cellules épithéliales multinucléées à l'examen cytologique avec test de Tzanck.¹¹

La culture virale ou le titrage d'anticorps sont cependant plutôt déconseillés, car ces techniques sont coûteuses et lentes. Les résultats parviennent donc au praticien souvent lorsque le patient est déjà en voie de guérison.⁸

La technique d'immunofluorescence directe reste la technique de choix. Elle est en effet rapide et fi-

able à plus de 80 p. cent. Elle prend moins d'une heure; elle est efficace même si les vésicules buccales sont infectées ou rompues, et donne des informations spécifiques sur le virus en cause.¹¹

Lorsqu'on utilise ces techniques, le diagnostic différentiel est facilité et permet d'éliminer certaines maladies infectieuses comme une herpangine, une mononucléose, une infection à adénovirus, une diphtérie, une angine de Vincent, une pharyngite à streptocoques, ou un érythème multiforme.^{1,11}

Cependant, les symptômes souvent associés à l'éruption des dents primaires : difficulté de s'alimenter, somnolence, fièvre et irritabilité, ressemblent aux symptômes de la primo-infection herpétique. Ils pourraient même être causés pour certains auteurs par une primo-infection non diagnostiquée.⁷ Ceci devrait influencer le traitement des accidents d'éruption chez l'enfant.

Traitement

Les croyances populaires multiplient les méthodes de traitement de l'herpès. Parmi celles-ci, on conseille l'ail, la glace avec du sel, le dentifrice, l'alcool à friction et l'huile homéopathique, qui pourraient agir utilisés en topiques au cours de la phase prodromique.

Le traitement de la douleur et celui de la déshydratation restent primordiaux. Des rinçages buccaux avec de l'eau tiède et du bicarbonate de soude, une prescription d'analgésiques adéquats, une diète molle et liquide,^{2,8} peuvent parfois éviter au sujet l'hospitalisation pour déshydratation.

Un rince-bouche antiseptique peut aussi réduire l'infection bactérienne secondaire.³

Enfin, l'acyclovir en topique trois fois par jour sous forme d'une crème à 5 p. cent,^{2,3} ou en administration systémique dans le cas de lésions étendues ou récurrentes, peuvent modifier le processus dynamique de la maladie.

Une femme de 32 ans traitée à l'acyclovir pour une gingivostomatite herpétique à son hui-

tième mois de grossesse, a accouché d'un enfant sain, quatre semaines après cet épisode.¹²

Si l'utilisateur lui-même peut parfois mettre en doute l'efficacité de ce médicament, la recherche en immunologie a des chances d'apporter un espoir au traitement. Une recherche russe préconise en effet l'injection intramusculaire d'immunoglobulines à haut titrage d'anticorps, comme étant efficace contre l'herpès primaire et récidivant.¹³

Bien que ce traitement n'ait été utilisé qu'en recherche, on a aussi administré à des enfants comme agent virostatique, une suspension aqueuse de lactobacilles quatre fois par jour pendant sept jours. Ce traitement contribuerait à éliminer la douleur en 48 heures et à faire se cicatrifier les lésions en sept jours.⁸

La chronicité difficile à vivre qu'adopte la maladie herpétique, devrait inciter à susciter sa prévention. La latence elle-même peut être prévenue par une thérapie anti-virale, mais à condition que celle-ci soit initiée dans les 48 heures de l'exposition au virus.¹

Il serait aussi judicieux d'instruire le public sur les possibilités de transmission de la mère à l'enfant, de l'enfant à la mère, du patient au praticien, du praticien au patient, et du patient à lui-même.

L'enjeu d'une bonne prévention qui incite à une extrême prudence, est de permettre d'éviter les désagréments aigus d'une maladie chronique. ■

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Le D^r Isabelle Lacroix est résidente en dentisterie pédiatrique, Hôpital Ste Justine et Université de Montréal.

Le D^r Christiane Mascrès est professeur titulaire, stomatologie, faculté de médecine dentaire, Université de Montréal.

Demande de tirés à part : Le D^r Christiane Mascrès, Faculté de médecine dentaire, Université de Montréal, Case Postale 6128, Succursale A, Montréal (Québec), H3C 3J7.



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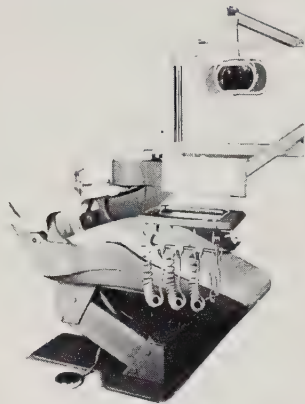
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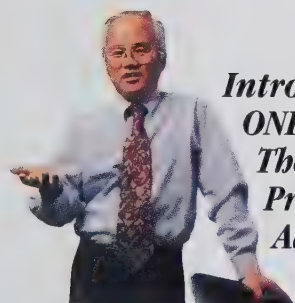
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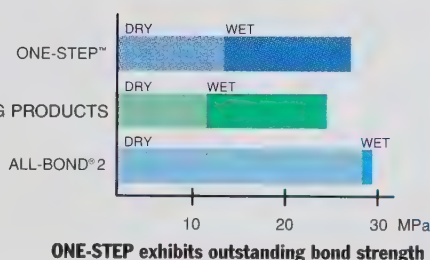
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2. Kanca, J.J. "Etchant Composition and Bond Strength to Dentin". Am J Dent 1993;6:162-164.
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* US Patent #5,348,988 † US Patent #5,385,728 ‡ moist does not mean saliva or blood contaminated
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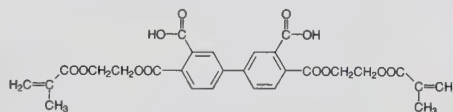
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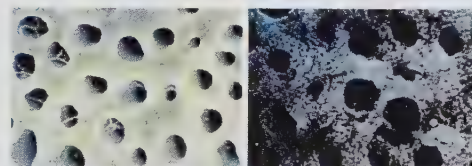


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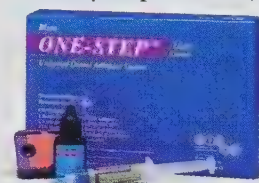
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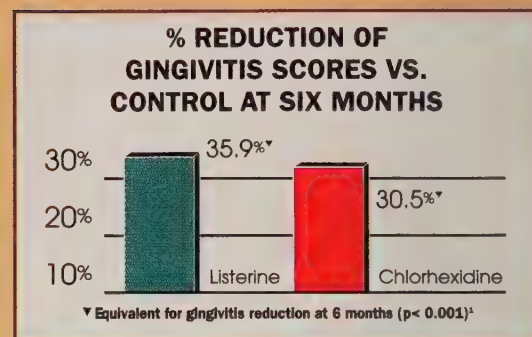
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¹ Overholser CD et al. Comparative effects of two chemotherapeutic mouthrinses on the development of supragingival dental plaque and gingivitis. *J Clin Periodontol* 1990;17:575-579

² Data on file, 1995

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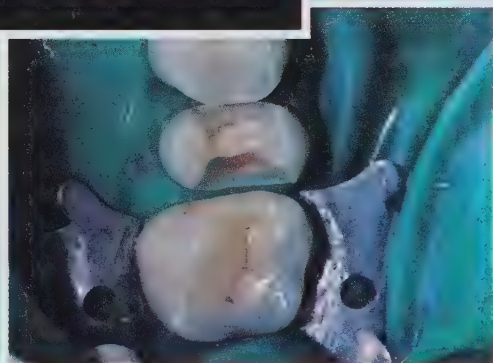
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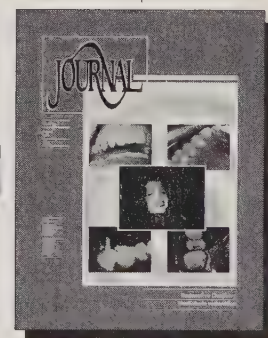
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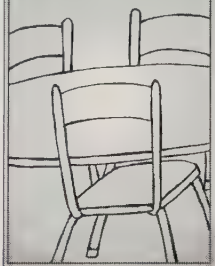
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MEETINGS & COURSES



INTERNATIONAL



October 23-27

83rd FDI Annual World Dental Congress in Hong Kong. For information contact: Laura Stephenson (613) 523-1770 ext. 246.

October 31 - November 4

Centenary Congress — 28th International Dental Meeting in Buenos Aires, Argentina and sponsored by the Asociación Odontológica Argentina. For more information contact: Dr. Guillermo Pisarenko, president, Junin 959, (1113) Buenos Aires, Argentina. Tel.: (1) 961-6141, or fax: (1) 961-1110.

November 15-17

Annual Congress of the Swedish Dental Society in Stockholm, Sweden. For more information contact: Charlotte Nackstad, Swedish Dental Society, Box 5843, S-102 48 Stockholm, Sweden. Tel.: (8) 666 15 00, or fax: (8) 662 58 42.

January 19-23, 1996

18th Asian Pacific Dental Congress & 50th Indian Dental Conference in Bombay, India. For more information contact Dr. Ashok Dhoble, Organising Secretary, 18th A.P.P.D. & 50th I.D.C., 534 Bombay Mutual Terrace, 2nd Floor, Sandhurst Brige Opera House, Bombay 400 007 India. Tel.: 91-22-361 0248, or fax: 91-22-367 2627

CANADA



September 8-9

How to do Selective Orthodontics in the General Practice — Modules 1 and 2 — Co-sponsored by Space Maintainers Laboratories and Dalhousie University. Presenter: Dr. Walter Pfitzinger. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

September 8-9

The University of Western Ontario's faculty of dentistry presents The Mustang Dental Symposium. Two days of clinically relevant education — two simultaneous programs — more than 30 speakers, to be held at the Radisson Hotel in London, Ont. For further information contact: Ms. Najet Hassan, Continuing Dental Education, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

September 13-17

First joint meeting of the **Canadian and American Associations of Oral & Maxillofacial Surgeons (Annual Meeting)** at the Metro Toronto Convention Centre with business sessions at the Royal York Hotel, the official headquarters hotel. For information please contact: Dr. Al Swanson, Executive Director, CAOMS, 333 Wethersfield Dr., #304, Vancouver, B.C. V5X 4M9. Tel./Fax: (604) 322-3025.

September 13-17

31st Annual Meeting of the Canadian Academy of Endodontics at the Westin Hotel, Ottawa, Ont. For information contact: Dr. William J. Kost (519) 672-4611, or Dr. George Citrone (613) 238-2463.

September 14-16

Canadian Association of Orthodontists — Annual Scientific Session at the Chateau Laurier Hotel in Ottawa, Ont. For more information contact the Canadian Association of Orthodontists at (416) 491-3186, or fax (416) 491-1670.

September 14-16

Canadian Academy of Restorative Dentistry and Prosthodontics is holding its scientific session in Toronto, Ont. at the Four Seasons Hotel. For more information contact: Dr. Jeff Martin, 1995 Convention Registrar, 90 Eglinton Ave. W., Suite 111, Toronto, Ont. M4R 2E4, or call (416) 488-7914.

September 15-17

Canadian Academy of Pediatric Dentistry/Académie canadienne de dentisterie pédiatrique, Annual meeting/Congrès Annuel at the Sheraton Centre, Montreal, Que. For more information please contact: Dr. L.-R. Charette, 3550 Côte-des-Neiges, Suite G-80, Montreal, Que. H3H 1V4. Tel.: (514) 931-1155.

September 29

The Dentist and Ethical Decision Making — Presenter: Dr. Nuala P. Kenny. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

September 30

Everything You Wanted to Know About Street Drugs but Were Afraid to Ask — Presenter: Dr. Hal Crossley. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

October 11-14

6th Annual Conference of the Canadian Association for Suicide Prevention (CASP)/6^e Congrès annuel de l'Association canadienne pour la

prévention du suicide (ACPS) in Banff, Alta. The theme of this conference is Building Connections for Suicide Prevention. For more information contact the Canadian Association of Suicide Prevention, c/o Suicide Information & Education Centre, 201-1615 10th Ave. S.W., Calgary, Alta. T3C 0J7. Tel.: (403) 245-3900, or fax: (403) 245-0299.

October 14

Advanced Periodontal Instrumentation — Presenter: Anna Matsuishi Pattison, R.D.H., M.S. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, fax: (902) 494-2527.

October 20

The University of Western Ontario's faculty of dentistry presents Dental Materials Review and Update. For information contact the UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

October 20

Southern Ontario Surgical Orthodontic Study Group Meeting in Windsor, Ont. For details contact Dr. Jeff Berger (519) 258-2632, or fax: (519) 258-2637.

October 20-22

21st Century Ceramics Symposium in Vancouver, B.C. For more information contact: Ms. Mary Thomas, Vancouver Seminar for Dentistry, 280-7580 River Rd., Richmond, B.C. V6X 1X6. Tel.: (604) 278-5426, or fax: (604) 278-6864.

October 21

A Review of Current Endodontic Concepts & Review of the Cracked Tooth Syndrome — Co-sponsored by The Annapolis Valley Dental Association and Dalhousie University. Presenter: Dr. Joseph J. Williams. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

October 26-27

Bridging Communities, Building Futures, 24th Annual Scientific and Educational Meeting of the Canadian Association of Gerontology at the Hyatt Regency Hotel, Vancouver, B.C. For registration information please write to: Conference Secretariat, c/o Gerontology Research Centre, Simon Fraser University, 515 W. Hastings, Suite 2800, Vancouver, B.C. V3B 5K3. Tel.: (604) 291-5062, or fax: (604) 291-5066.

October 27-28

The University of Western Ontario's faculty of dentistry presents Guiding the Developing Dentition. Guest speaker: Dr. Jon T. Kapala. For information contact the UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

October 27-29

Workshop Meeting of the Canadian Association of Dental Consultants in Toronto, Ont. For information contact: Dr. W. Norgate, 901 St. Mary's Rd., Winnipeg, Man. R2M 3R4.

October 28

Older Dental Patients: Clinical Challenges and Practical Approaches — Presenter: Dr. Kenneth Shay. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

October 28-31

Annual Meeting of the Great Lakes Association of Orthodontists in Toronto, Ont., at the Westin Harbour Castle Hotel and Convention Centre. For information contact Dr. Paul C. Levin, General Chairman, 4288 Village Centre Court, Mississauga, Ont. L4Z 1S2. Tel.: (905) 275-8501, or fax: (905) 275-5213.

November 3-4

How to do Selective Orthodontics in the General Practice — Modules 3 and 4 — Co-sponsored by Space Maintainers Laboratories and Dalhousie University. Presenter: Dr. Walter Pfitzinger. For information

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Septanest SP

(articaine hydrochloride 4% with 1:100,000 epinephrine)

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Since **Septanest** contains epinephrine the caution required of any vasoconstrictor drug is in order.

Warnings

Septanest, along with other local anesthetics, is capable of producing methemoglobinemia. The clinical signs of methemoglobinemia are cyanosis of the nail beds and lips, fatigue and weakness. If methemoglobinemia does not respond to administration of oxygen, administration of methylene blue intravenously 1 to 2 mg/kg body weight over a 5 minute period is recommended.

Precautions

Each time a local anesthetic is used, anti-convulsant medicines (benzodiazepines or barbiturates which can be injected), myorelaxants, atropine and vasopressors, resuscitating equipment (in particular a source of oxygen) enabling artificial ventilation, should be available. The safety and effectiveness of local anesthetics depend upon proper dosage, correct technique, adequate precautions, and readiness for emergencies in persons with known or suspected drug allergies or sensitivities to amide-type local anesthetics. **Septanest** should be given cautiously.

Patients with Special Diseases and Conditions

In patients with peripheral vascular disease or injection into areas with limited blood supply, the use of a local anesthetic containing a vasoconstrictor should be made with caution. Due to the presence of epinephrine, **Septanest** is not advised for diabetic subjects.

Use in Pregnancy

Safe use of local anesthetics during pregnancy prior to labor has not been established with respect to adverse effects on fetal development. Careful consideration should be given before administering these drugs in pregnant women.

Adverse Reactions

Reactions to **Septanest** (articaine hydrochloride) are characteristic of amide-type local anesthetics.

Adverse reactions of this group of drugs are generally dose-related and may result from high plasma concentrations of anesthetic caused by inadvertent intravascular administration, overdosage, or rapid absorption from the injection site as well as reduced patient tolerance, idiosyncrasy, or hypersensitivity.

Dosage and Administration

Septanest N (articaine 4% with 1:200,000 epinephrine)

Septanest SP (articaine 4% with 1:100,000 epinephrine)

As with all local anesthetics the dosage varies and depends upon the area to be anesthetized, the vascularity of the tissue, the number of numeral segments to be blocked, individual tolerance and the technique of anesthesia.

Do not exceed the equivalent of 7 mg/kg articaine hydrochloride body weight which corresponds, for a subject weighing 60 kg, to 6 standard 1.7 ml cartridges. The lowest dosage needed to provide effective anesthesia should be administered.

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Procedure	Volume (ml)	Total Dose (mg)
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Nerve Block	0.5-3.4	20-136
Oral Surgery	1.0-5.1	40-204

Children

For **Septanest N** and **Septanest SP** use in children under 4 years of age is not recommended. The quantity to be injected should be determined by the age of the child and the size of the operation. Do not exceed the equivalent of 7 mg articaine hydrochloride per kilogram of body weight.

Presentation

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PAAB



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Août
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contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 4

Infection Control — Presenters: Heather Bowers, R.D.A. and Cathy MacLean, B.N. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 4

The University of Western Ontario's faculty of dentistry presents Oral Pathology and Panoramic Radiology. For information contact: UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

November 18

Rationale for Antibiotics in Periodontics — Presenters: Dr. Dan Price, Dr. Crawford Bain, Dr. Gary Foshay and Dr. Terrie Logue. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 30 - December 2

The University of Western Ontario's faculty of dentistry presents Crown and Bridge Back to Basics. For information contact: UWO, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

December 2

Bonded Restorations: How to make an Informed Choice in Selecting Materials and Techniques — Presenter: Dr. A. John Gwinnett. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

January 12-13, 1996

1- Assessment and Management of Medical and Dental Emergencies, 2- Oral Surgery Solutions to Help the Clinician Solve Common Clinical Problems for the Dental Patient — Presenters: Dr. Archie Morrison and Dr. Reginald Goodday. For information contact: Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

U.S.A.



September 15-16

The American Dental Association, Michigan Dental Association and West Michigan Dental Society are proud to celebrate during 1995 the **50th Anniversary of Community Water Fluoridation in the United States.** An international symposium on community water fluoridation will be held at the Van Audel Center in Grand Rapids, Mich. For more information contact: Dr. Arnold Morawa or Ms. Debbie Montague, University of Michigan School of Dentistry, 1011 N. University Ave., Ann Arbor, Mich. 48109-1078. Tel.: (313) 764-6856, or fax: (313) 936-3065.

October 4-6

58th Annual Meeting of The American Association of Public Health Dentistry — Call for Abstracts. The AAPHD is inviting papers on a broad range of dental public health topics for presentation at its annual meeting. The theme of this year's meeting is "Oral Health: The Primary Care and Prevention Model." Deadline for submission is May 1, 1995. For further information contact AAPHD National office, 10619 Jousting Lane, Richmond, Va. 23235-2828. Tel: (804) 272-8344, or fax: (804) 272-0802.

October 7-11

136th Annual Session of the American Dental Association in Las Vegas, Nev. For more information contact the American Dental Association,

211 E. Chicago Ave., Chicago, Ill., 60611, U.S.A. Tel.: (312) 440-2658, or fax: (312) 440-2707.

November 16-18

Annual Meeting of the Academy of Dental Materials in San Diego, California. For information contact the Academy of Dental Materials, c/o ARDEL Management, Inc., 6518 Walker St., Suite 150, Minneapolis, Minn. 55426-4244. Tel.: (612) 927-6707, or fax: (612) 927-8127.

November 27-28

American Board of Oral and Maxillofacial Radiology 1995 — Certifying Examination. Applications must be submitted by May 15, 1995. For further information please contact Dr. Curtis Lundeen, School of Dentistry — Oral Radiology, Oregon Health Sciences University, 611 S.W. Campus Dr., Portland, Ore. 97201-3097. Tel.: (503) 494-8930.

Notices of meetings and continuing education courses are published without charge for appropriate **not-for-profit** dental organizations, teaching facilities or recognized study clubs. Information must be received two months prior to expected publication date, and will be published at the discretion of the editor. Send all requests C/O Ms. Rachel Galipeau, *Journal* Editorial Assistant, Canadian Dental Association, 1815 Alta Vista Dr., Ottawa, Ont. K1G 3Y6.

DID YOU KNOW?

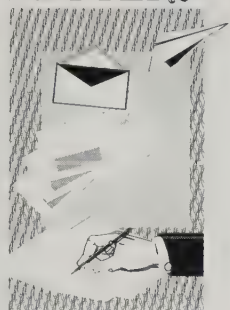
Some Facts on Fat:

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LETTERS



Dental Amalgam

There is a misconception in the article Dental Amalgam: Scientific Consensus and CDA Policy (Henderson, B, *JCDA* 61:429-432, 1995), that should be corrected. Two sentences on page 429 imply that mercury vapor from dental amalgam is released only when chewing. On the contrary, mercury vapor from dental amalgam is released continuously whether one is chewing or not. This fact can be verified by "sniffing" the air in the vicinity of a dental amalgam sam-

ple by means of either the Jerome Mercury Analyzer, or the Bacharach Model MV2 Sniffer.

It is my personal opinion that the patient is relatively safe when it comes to the use of dental amalgam as a restorative material. My opinion is based in part on current knowledge and on the fact that dental amalgam has a proven track record of well over a century. Admittedly, people do get allergies and other problems may occur; for example, penicillin, milk, and peanuts have yet to be condemned by the media.

My primary concern is what the health sequelae may be for the dentist, for that dentist's staff and possibly for other people working in the same building. These individuals may not be aware that they might be chronically exposed not only to unsafe levels of mercury vapor, but also to unsafe levels of comparable agents from the variety of materials found and used in that dental office. This exposure to harmful chemical vapors as well as to particulate matter may come in part from lack of

knowledge of the dangers or improper handling.

If the building where the dental office is located has a closed ventilation system then the harmful vapors, the particulate matter and the microorganisms released from any office in that building could be recycled to the detriment of all the occupants — the sick building syndrome.

Proper ventilation is one of the key principles of good industrial hygiene practice. Regrettably, many individuals involved directly or indirectly with the dental profession appear to be totally unaware of these principles.

Both the knowledge and the technology related to occupational health and safety in the dental office exists, but does the will to acquire and to properly apply that knowledge also exist within both the profession and its industry.

The profession needs education and self regulation in the field of workplace health and safety. It does not need government imposed legislation.

Z.W. Fedun, BAsC., PEng., DDS.
Toronto, Ontario

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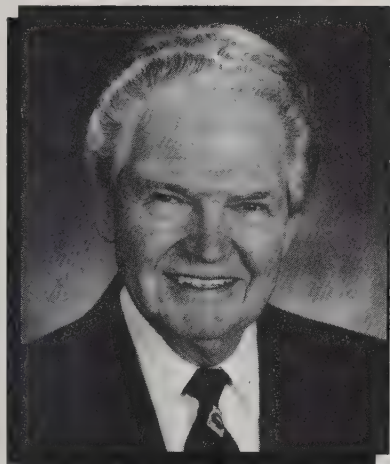
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EDITORIAL

CDA = CAN'T DO-IT ALONE



Dr. P. Ralph Crawford,
Editor

Down through the years, CDA has teamed up with a number of outside organizations to initiate activities and programs of mutual interest to both parties. Some of these projects were short-lived ventures, others are still ongoing. But all of them were designed as win-win scenarios, for CDA, its members, and the participating outside organizations.

If I recall my biology 101 correctly, this type of relationship is referred to as symbiosis. According to Webster's, symbiosis is a Greek derivation meaning to live together. From a biological perspective, it's defined as: "the living together of two dissimilar organisms in close association or union, especially where this is advantageous to both."

What the dictionary doesn't mention is that the advantages of organizational symbiosis aren't always clear cut. On more than one occasion, CDA has been criticized for entering into a symbiotic relationship with an outside group, with comments ranging from: "Why are we getting involved with commercial organizations?"; or, "What do we need them for?"

The inference is that professional associations such as CDA somehow sully their image when they "make deals" with outside partners, and that we must somehow, somehow, hold ourselves above and beyond the

types of activities that are so much a part of everyday life in the business world. Another misconception is that Canadian dental organizations are large enough and rich enough to go it alone — that there is a bottomless pit of money that we can draw from to mount needed projects.

A number of years ago, at a special reception to thank the host province of CDA's annual convention, as well as the dental manufacturers and distributors who had taken out booth space, the president of the day explained: "The letters C-D-A stand for more, much more, than the Canadian Dental Association. They also represent the concept that we dentists Can't Do-It Alone. To fulfil the goals and aspirations for both organizations, it is necessary and essential for both to work together for mutual benefit."

Even 18 years ago, this message was really not that original. Nor has it changed much down through the years, because we know for a fact that symbiosis works.

In 1984, when CDA launched its Dental Awareness Program (DAP), it was the single largest public information campaign on oral health ever mounted in Canada. This was no easy task, and we clearly couldn't have done it alone. But with the help of a Toronto consulting firm, we convinced the private sector to buy into a unique "leverage" strategy. For every dollar that CDA raised on its own, commercial sources would contribute four to five dollars more in return for sponsorship recognition.

Another "symbiotic" success story is the CDA/Colgate Dental Information System — otherwise known as our DIS pamphlet program. First distributed in 1991, the 16 educational pamphlets in the DIS series are now used by thousands of dental offices across Canada to inform patients about oral health concerns and possible treatment choices. Although these pamphlets were developed, published and distributed by CDA, the DIS program would not have been possible without significant financial support from Colgate Palmolive.

Similarly, five years ago CDA recognized that new graduates were facing a whole new set of chal-

lenges, and considerable stress and strain, because of the changes occurring in a shrinking dental marketplace. Possessing neither the financial resources nor the specific expertise to combat the problem on its own, CDA entered into a cooperative agreement with ExperDent Consultants of Vancouver to develop a new lectures series, *The Bridge to Practice Success*, for senior students, as well as a unique practice management guide, *Getting Started in Dentistry: Your First Five Years*. The relationship was a success. In fact, it worked so well that CDA and ExperDent jointly developed three new lectures for established dentists, *Surviving & Thriving in the '90s*, *Reaching Out* and *The Bottom Line*.

A brand new cooperative effort — this time between CDA, a specialist group and a commercial enterprise — will be launched August 26-29 during CDA's 1995 convention in Ottawa. Called the Periodontal Screening and Recording Program (PSR), it's a joint initiative of CDA, the Canadian Academy of Periodontology and Procter and Gamble Canada Inc.

PSR is designed to be part of the regular patient examination. It not only helps dentists to quickly and accurately screen their patients for periodontal problems, it also provides them with a simple, effective charting system to record their observations.

No doubt, there will be some criticism of the PSR program by those who maintain that CDA should stay pure and untainted by cooperative commercial ventures. My suggestion to them, quite simply, is that they consider the bottom line. Down through the years, if private entrepreneurs had not invested millions of dollars in joint initiatives with CDA, one of two things would have occurred. Either the money would have had to come from members' dues, or CDA would not have been able to fulfil its mission of: "meeting member needs and the promotion and provision of optimal oral health for Canadians." I am more convinced than ever that CDA = Can't Do-It Alone!

P. Ralph Crawford, BA, DMD
Editor of the Journal of the
Canadian Dental Association

JOURNAL

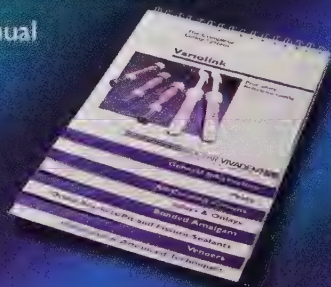
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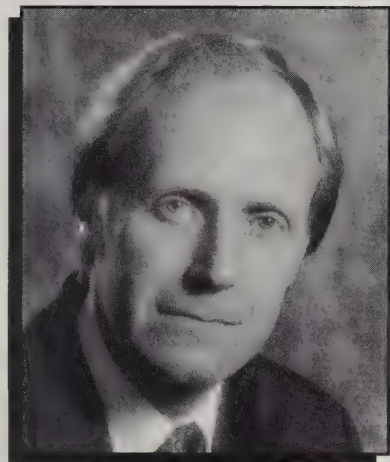
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PRESIDENT'S COLUMN

FROM MAINTENANCE TO MISSION



Dr. Bryun Sigfstead,
President

CDA was established in 1902, when the dentists of Canada recognized a need to join together in a cohesive way to solve common problems and accomplish common goals. It was an historic moment, because it was at this point that we, as dentists, really became the guardians of our profession.

The right of association was and is a great privilege. But this privilege comes with its own set of challenges and responsibilities. When CDA was formed, the dentists of Canada accepted an obligation to protect not only the integrity of the dental profession, but also the oral health of Canadians.

I think we've done very well in this dual role over the last 93 years. But it is an ongoing commitment. We must continue to play our part effectively and well over the next 100 years, and more, if we want to maintain the integrity and strength of this great profession.

With all the changes occurring in dentistry today, from the erosion of third-party plans to the decreased demand for dental services, the task we've set for our-

selves will be difficult. We know only too well that there are external and internal forces at work that have the potential to precipitate the deterioration of our profession. What we don't know, yet, is how we are going to overcome these challenges.

It's easy, as a profession, to assess where we are at any given time. But our ultimate success will depend on how well we prepare and plan for the future. The key will be to identify both the challenges and the opportunities that lie ahead, and to ensure that we have a vision — a realistic mental image of where we want to be in 10 to 20 years.

CDA's current vision is codified in our mission statement. In 37 short, inspiring words, the statement describes our fundamental purpose, and states who and what we are. It's really the cornerstone that allows our complex assortment of goals, objectives, committees and programs to exist together as the unified, cohesive entity that we know as CDA.

We rely on our mission statement to keep focused on our purpose, to evaluate how well we are meeting the needs of our members and the public, and to bring us closer to our vision. CDA is not only very aware of the benefits of a good mission statement, we believe that it is essential to our long-term success.

Each fall, during our annual planning session, we revisit our mission statement, goals and objectives to ensure that they continue to reflect the needs of our members and the profession, and that our vision positions us to face the future as a strong, effective organization.

It's an ongoing process, and it's one that brings me a great deal of satisfaction. I know that when my term as CDA president comes to an end this month, I'll leave behind a strong, healthy, and proactive organization, one that is well equipped to meet the challenges facing our profession. To my mind, CDA's commitment to revisiting its mission statement each year is my best assurance, and yours, that our national association will continue

to be the "authoritative national voice, resource, and focus of unity for the profession of dentistry in Canada."

It's never easy to say goodbye. But when I turn over the reins to CDA's next president, I will do so with a sense of pride at all this association has accomplished on behalf of the dental profession in 1994-95.

My year as CDA's president has been full of personal challenges and rewards, and it's given me an opportunity to meet and talk to dentists from coast to coast. Not surprisingly, I also spent a lot of time in meetings, discussing current issues, and considering our policies, positions and strategies.

I firmly believe that communication with our members, with government and with the media, as the national voice of dentistry in Canada, will be the key to CDA's ongoing success. The other factors that will no doubt come into play as we head into the year 2000 are cooperation, unity, and teamwork.

Like clinical dentistry, organized dentistry relies on a team effort to achieve results. It's the volunteers who serve on the committees, the staff members who implement our policies, and the CEOs who really make things happen.

I'd like to personally thank Jardine Neilson, CDA's capable executive director, and his staff, as well as my partners on management, Drs. Jim Brookfield and Barry Dolman, and all the members of executive council for their support this year. I'd also like to wish Dr. Jim Brookfield and his management team well as they take over the leadership role at CDA.

But most importantly, I'd like to thank all of you, the members of CDA, for giving me the opportunity to serve as your president over the past 12 months. I can only hope that I lived up to your expectations. It's certainly been a year that I will never forget.

*Bryun Sigfstead, DDS
President of the Canadian
Dental Association*

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BOOK REVIEWS

Plaque & Calculus Removal: Considerations for the Professional

by David L. Cochran, Kenneth L. Kalkwarf, Michael A. Brunsvold

1994, Quintessence Publishing Co. Inc., Chicago; 98 pages, color and B & W photographs

This book consists of seven short chapters and is intended primarily to assist the general dentist and hygienist in understanding the consequences of plaque accumulation and the requirements for its removal. According to the preface, it is not intended to be a comprehensive review of plaque and calculus nor is it intended to describe specific mechanical approaches. Rather, it presents a general overview of the rationale for treatment, mechanical therapy, as well as some chemotherapeutic modalities.

The first chapter deals with a concept that dental professionals should be very well versed in; the rationale for plaque and calculus removal. The classic studies of Loe et al are discussed, as well as the therapeutic results for scaling and root planing, outlining a sequencing of therapy. This is a valuable point and warrants more elaboration than the oversimplified version provided by the authors.

A valuable chapter on homecare for the patient is presented with good illustrations and photographs. The authors recognize the importance of customizing this regimen to the individual patient and offer many suggestions in this regard.

Chapters 3 and 4 deal with the mechanical removal of plaque and calculus. The authors present a concise but well laid out approach, emphasizing the anatomic limitations of treatment with several good suggestions for dealing with these restrictions. Special considerations for the removal of plaque and calculus around dental implants are well discussed in the last chapter. In Chapter 3, cardiac considerations are touched on sparingly with respect to bacteremia and the use of prophylactic antibiotics. What I found disappointing was the omission of a more thorough listing of patients at risk, including patients with special considerations such as those with localized juvenile periodontitis.

Topical antimicrobial agents used as adjuncts to mechanical plaque

control procedures are discussed and the authors clearly outline which agents are of value. They also emphasize that the use of chlorhexidine requires an understanding of the agent, and provide instruction for managing potential side effects.

In summary, this text is an easy-to-read, well-illustrated overview of plaque and calculus removal from teeth and implants, however it should not be viewed as a comprehensive manual. It would serve as a good reference manual for the dental hygienist and auxiliary staff or in assisting general dentists in refreshing their knowledge in this area.

Reviewed by:

Theresa A. Bankey B.Sc., DDS, MRCD(C), practising periodontist in Oakville, Ontario.

Introduction to Dental Materials

by Richard van Noort

1994, Mosby-Year Book
236 pages, B & W illustrations
ISBN: 0-7234-1963-9

According to the author, this book is intended "for dentists with a good foundation in dental materials." The author also states that the book will consider only "those aspects of the behavior of materials that are pertinent to dental applications . . ." In keeping with these objectives, most scientific dental materials topics are presented in a superficial manner and the text serves more as a review than a source of new knowledge. Rather than being a weakness, this means that information rele-

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vant to the busy practitioner is emphasized and is not lost in scientific details.

Clinicians, in particular, will appreciate the sections which discuss the clinical application of the material's properties and the clinical effects of the manipulative variables. For example, the chapter on dental amalgam presents sections relating proper cavity design, proper matrix application, contamination and condensation to both the materials characteristics and the clinical outcome.

Unfortunately, each chapter presents this topic under a different heading. From the reader's standpoint, this information would be much more easily found if it were presented under the same subject heading in each chapter.

The author is to be commended for including a chapter on endodontic materials. Although the ITGP (Injectable Thermo-plasticized Gutta-Percha) method is not mentioned, and the chapter is only six pages long, it is nice to see all the endodontic materials brought together in one place. Surprisingly, the calcium hydroxide cements used for endodontics are classified as composite resins. The text also contains information on such contemporary systems as resin to dentin bonding, hybrid or glass ionomer/resin cements, and CAD/CAM.

Some topics are either dealt with too briefly or not at all. The selection on the general biocompatibility of materials occupies just one page and the highly controversial topic of mercury toxicity occupies only one-half page. There is nothing on dental waxes or on resin to metal bonding. The chapter on Dental Casting Alloys for Metallic Restorations covers both the gold based and alternative alloys in only a scant eight pages, including six tables.

Although the astute reader may be able to correctly figure out how to properly manipulate the materials based on the minimal information given, this is not a "how to" book. The text would have benefited from a short section on proper manipulation for each of the materials discussed. The text is richly and effectively illustrated with line drawings but contains only nine actual photographs.

In summary, this book is a worthwhile read for those who want to improve their practice through a better understanding of the important relationships between the science of dental materials and clinical practice.

Reviewed by:

Dr. Peter T. Williams, B.Sc., M.Sc., DDS
Associate professor,
department of restorative dentistry,
University of Manitoba.

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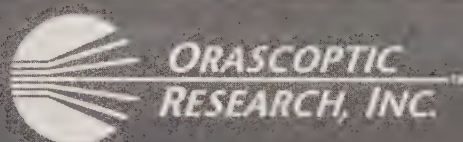
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NEWS UPDATE

Dr. Clive Friedman To Head ADPD

Dr. Clive Friedman of London, Ontario, was elected president of the Academy of Dentistry for Persons with Disabilities (ADPD) during the association's 7th annual national conference on Special Care Issues in Dentistry, held April 28-30 in Chicago, Ill.

Active with ADPD for many years, Dr. Friedman's interests include access to care for persons with disabilities, as well as behavior management issues. He is currently in private practice, and serves in a part-time capacity in the University of Western Ontario's dental faculty. ■

1995 W.W. Wood Award Recipients Named

Eight dental faculty members received special recognition this year, when they were presented with the Association of Canadian Faculties of Dentistry's (ACFD) W.W. Wood Award for excellence in dental education.

Dr. Grace Petrikowski, University of Alberta; Drs. Helen Scott and Dr. Ravi Shah, University of British Columbia; Dr. Noel H. Andrews, Dalhousie University; Dr. Christopher Lavelle, University of Manitoba; Dr. Herb Borsuk, McGill University; Dr. Donald G. Woodside, University of Toronto; and Dr. Glen Walker, University of Western Ontario; all received the W.W. Wood award for the exemplary work they have undertaken on behalf of their respective dental faculties.

Each year, ACFD awards the W.W. Wood award to a full or part-time faculty member who has completed at least three years of teaching in a Canadian faculty of dentistry.

The award was established in 1991 in memory of Dr. William Winston Wood.

A member of the University of British Columbia's dental faculty since 1972, the Australian-born Dr. Wood became a full professor in the department of clinical dental sciences during the 1990 academic year.

Dr. Wood died in 1990, after serving the university in many capacities and achieving international

recognition for his research studies. He believed strongly in the role of research in advanced education. ■

HIV Leading Cause of Death in U.S.

HIV is now the leading cause of death among Americans aged 25-44, according to the Centers for Disease Control and Prevention (CDC).

The new data, published in the February 3, 1995, issue of CDC's *Morbidity and Mortality Weekly Report*, did not come as a surprise.

"AIDS was expected to rise to the top of the list eventually," said Dr. Harold Jaffe in a January 31, 1995, *New York Times* article, "but no one had predicted which year."

The number of reported AIDS cases in the U.S. actually dropped from about 106,000 in 1993 to about 80,000 in 1994.

According to a news item published in the April 1, 1995, issue of the *Journal of the Canadian Medical Association*, the total number of reported AIDS cases in Canada had reached 10,689 at the end of 1994. The same article reported that 10,000 adult males, 576 adult fe-

The Art and Science of Dentistry

Dentistry has traditionally been described as an "art and a science." Although the science has had increasing attention in recent years, not everyone takes the "art" as seriously as Holly Blaikie, a first year dental student at Dalhousie University.

As part of Dalhousie's first year oral histology course, students participate in "learning issues" seminars that require them to present their new-found knowledge to colleagues. Ms. Blaikie's assignment was to describe the microscopic structure of enamel. But she didn't opt for the conventional approach to illustrating all of enamel's intricacies and relationships. Instead, she composed and



Dental student Holly Blaikie and her painting, "Hues in Histology."

created a full color painting — "Hues in Histology."

Ms. Blaikie's fellow students and senior colleagues were so impressed with the final work that they encouraged her to do-

nate her creation to the faculty, so that students, staff, faculty and visitors could revel in it, and truly enjoy and learn the full meaning of the "art" and science of dentistry. ■

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males, and 113 children under age 15 have been diagnosed with the disease in Canada to date, and that 7,471 of these patients (69.9 per cent) have died.

The article also said that the proportion of adult AIDS cases involving gay men in Canada has been decreasing steadily, from 81.5 per cent in 1988 to just 73.5 per cent of total cases in 1992 and 1993. However, the proportion of adult AIDS cases attributed to injection drug use increased from 4.6 per cent in 1988 to 10.2 per cent in 1993.

Globally, more than one million AIDS cases have been reported to the World Health Organization to date. An estimated 18 million adults and 1.5 million children have been infected with HIV since the late 1970s. ■

OBITUARIES

Creasy, Dr. George I.: A life member of the Canadian Dental Association, Dr. Creasy graduated in 1938 from the University of Toronto's faculty of dentistry. He retired in 1988, and lived in Aldergrove B.C. He died September 12, 1994.

Crépeau, Dr. Alexandre: A graduate from the University of Montreal in 1925, Dr. Crépeau was a life member of the Canadian Dental Association. He died on May 15, 1995.

Dore, Dr. John N.: A 1930 graduate from the University of Toronto's faculty of dentistry, Dr. Dore, of Port Dover, Ont., was a life member of the Canadian Dental Association. He died February 13, 1995.

Green, Dr. Robert O.: Born in Toronto and educated in Scarborough, Dr. Green entered the University of Toronto's faculty of dentistry in 1939 and graduated with honors in 1943. After graduation he was posted with the Canadian Dental Corps (Army) in Chilliwack, B.C., and was a member of an Eskimo operation in the Arctic. He was an associate at the faculty of dentistry (U of T) for 28 years, and maintained a practice in Scarborough for 47 years. He died May 7, 1995, in Scarborough.

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Johnson, Dr. C.E.: A life member of the Canadian Dental Association, Dr. Johnson, of North Battleford, Saskatchewan, graduated from the University of Toronto's faculty of Dentistry in 1951. He died on June 4, 1995.

Johnson, Dr. Carl P.: A 1943 graduate from the North Pacific College of Oregon, Dr. Johnson practised dentistry in West Vancouver for almost 45 years. He was a life member of the Canadian Dental Association. He died on June 15, 1995, at the age of 78.

Just, Dr. Alvin H.: A resident of Cochrane, Alberta, Dr. Just graduated from the University of Toronto's faculty of dentistry in 1960. He died June 7, 1995.

LeSage, Dr. Theodore William: A 1958 graduate of the University of Toronto's faculty of dentistry, Dr. LeSage, of Nepean, Ont., retired in 1988. He died May 13, 1995.

McLean, Dr. William M.: A graduate from the University of Toronto's faculty of dentistry in 1950, he died April 5, 1995.

Milburn, Dr. W.B.: Born in Medicine Hat, Alberta, in 1901, Dr. Milburn graduated from the University of Toronto's faculty of dentistry in 1926. He died in May, 1995, at the age of 94.

Moran, Dr. James P.: A 1949 graduate from the University of Toronto's faculty of dentistry, Dr. Moran was a life member of the Canadian Dental Association. He retired in 1988, and lived in Abbotsford, B.C. He died March 26, 1995, at the age of 76.

Prothero, Dr. A.J.: A 1953 graduate from the University of Alberta's faculty of dentistry, Dr. Prothero was a life member of the Canadian Dental Association. He died in April, 1995.

Raymond, Dr. Léo: Died on December 6, 1994, at the age of 63. Dr. Raymond graduated from the University of Montreal's faculty of dentistry in 1959.

WHAT'S IT?

This month's "What's It?" mystery item comes to the *Journal* from Dr. William E. Larder of Halifax, Nova Scotia. Dr. Larder is asking readers to help him identify the pictured dental instrument. Shaped as if it was made to grasp something, the 13 cm long device has a knurled screw on one end, which opens and closes the jaws on its other

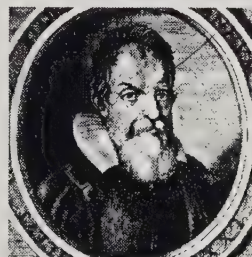
end. The lettering on the ebony-like handle reads "J.W. Ivory, Phila."

If you know what this instrument was used for, and can assist in its identification, please write to: The Editor, Dr. P. Ralph Crawford, Canadian Dental Association, 1815 Alta Vista Drive, Ottawa, Ontario K1G 3Y6. ■



"The sun is the center. The earth is round."
Galileo, the Astronomer, 1610.

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ABSTRACT

The long term clinical wear of posterior composite resins

This retrospective study evaluated data from 78 articles and 46 abstracts on the clinical wear of posterior composite resin restorations. The criteria for inclusion were that there be at least two to three years of data, at least five restorations in each material and more than one composite resin material mentioned in each study. There were a total of 28 different composite resin materials that fit the criteria established.

The use of self-curing composite resin materials for posterior restorations was widespread in the 1970s. The studies that evaluated the materials used during this time reported a widespread lack of clinical longevity and a significant number of early failures. The most commonly reported reasons for the clinical failure of these early self-curing materials were recurrent caries and excessive wear. The high number of failed restorations caused many practitioners to abandon the use of posterior composite resin materials.

The next decade saw the introduction of macro- and micro-filled composite resin materials, both self-curing and light polymerized. Since this time there has been extensive research into new materials that provide esthetic and resistance to wear. The relatively

recent introduction of hybrid type composite resin materials has resulted in much more favorable clinical results from five-year studies. The hybrid composite resin materials possess significant wear resistance and when placed under proper conditions will provide a superior esthetic result with good clinical longevity. The article ranked the three-year study results of the clinical performance of the most frequently tested composite resin materials. These rankings are somewhat difficult to rely on as they were compiled from multiple studies with different methods. The rankings from best to worst for three-year wear resistance are: Clearfil, Heliomolar, P30, Estilux, Occlusin, Adapt2, P10, Fulfil and Profile.

Although the deficiencies in the data available from the studies reviewed for this article do not allow an absolute ranking of available composite resin materials, the information is clinically useful. The importance of technique cannot be over emphasized and the long term clinical results of any material are contingent on careful adherence to proper placement techniques. The data in this review article indicate that when placed properly, hybrid composite resin materials are an acceptable restorative material for the restoration of posterior teeth. ■

Taylor, D.F. et al. *Am J Dent*; 7:167-174, 1994
The DENTALETTER — June 1995

LIBRARY PACKAGE



During the month of August, the CDA Library is offering an information package on **PERIODONTAL SCREENING AND RECORDING (PSR)**.

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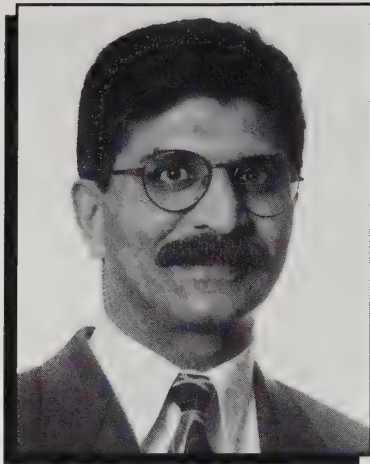
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Managing Emergency Patients

Imtiaz Manji, B.Sc.

Principal of ExperDent

Dentists seem to fall into two camps when it comes to treating emergency patients. Some view emergency patients as a wrench thrown into their carefully planned schedules. Others welcome the challenge of treating these individuals, and hope to turn each and every one into a regular, dentally-aware, patient.

I certainly understand the feelings of both camps. Seeing emergency patients can be a problem in some instances and an opportunity in others. However, there are ways to stack the odds in your favor, and take control over the situation so that you minimize the problems and maximize the opportunities.

The key to ensuring that emergency patients create a practice-building situation, not a practice-draining one, lies in the effective management of these patients and your practice. Emergency patients can be broken down into two distinct groups: new patients who come to you for the first time because of an emergency, and patients of record who require emergency treatment.

New Patient Emergencies

If you've handled your share of new emergency patients, you may have noticed a pattern: these patients usually arrive at your practice via the Yellow Pages (they've

chosen you for your convenient location), or from a referral. Their only motivation for seeing a dentist is to alleviate the pain or discomfort they're experiencing, or to get something fixed, such as a broken filling. Whether they're dental phobic or merely uninterested in maintaining their oral health, they present a unique situation for the dental practice. The problem is that patients in this group, more than any other, usually have the most resistance to becoming a regular patient. As such, emergency visits must be handled with extreme care.

If patients are coming to you more because of circumstances (they're in pain) than choice, you and your team need to work that much harder to get them to embrace dentistry and your practice. This begins with the phone call that the emergency patient makes to the practice. Your receptionist must be tuned to the emergency patient's mind-set, which almost always includes a desire to be seen as soon as possible. This means today.

Without some advance planning, however, seeing an emergency patient may be easier said than done. Many practices fail to schedule time for emergencies in the appointment book. If that's the case, agreeing to see an emergency patient may create a negative ripple effect that lasts for the entire day. You can't just squeeze

emergency patients in, you have to plan for the eventuality that they will call for help.

In the morning meeting, you and your team should discuss the time scheduled for emergencies. The receptionist, in particular, should take note of this, so that emergency appointments can be scheduled quickly if and when an emergency patient calls. This is also an opportunity to capture initial patient information such as name, address and phone number. Before concluding the call, the receptionist should make sure that the patient knows where the practice is, offer suggestions on possible routes to get there, and the best place to park if the patient is driving.

When an emergency call does come, your staff should assume that there really is an emergency even though there may not be. As long as the patient believes that his or her condition constitutes an emergency, his or her call should be handled accordingly.

The best approach is to schedule the emergency patient to arrive 10 to 15 minutes before the actual appointment, so that the necessary forms can be completed. From the moment the patient arrives at the practice, the team must be diligent about making him or her feel comfortable. This begins with the front desk team, who should warmly welcome new patients and assist them with any questions they may

have, be it about the patient history form or the practice in general.

The dental assistant carries the professionalism torch even further by extending a warm greeting and introducing him or herself to the patient by name. If the dentist has requested any preliminary treatment, such as X-rays, the dental assistant or dental hygienist should inform the patient about what is to be done and why before it happens. All too often, clinical teams forget that emergency patients are likely the least familiar with the procedures, jargon and dynamics of a dental practice. It's important to explain all procedures fully, in a way patients can understand, and to remove any mystery about their appointment by providing information about your diagnosis and their immediate and future treatment needs.

It's also important for patients to feel that they are in control of the situation, despite the prevalence of highly specialized staff and foreign looking equipment. Let them know that your main goal is to alleviate their pain, and that they should raise their hand if what you're doing causes discomfort or if they need to take a breather.

As a dentist, you're in the best position to assess the emergency patient's immediate and long-term treatment needs. However, most dentists find that emergency patients are much more likely to stick with a long-term treatment plan if they are not overwhelmed on the first visit. Emergency patients want the pain to go away in the shortest time possible. The best approach is to do what is needed for the short-term immediately, and then schedule follow-up treatment for another appointment(s). This lag time allows the patient to review the recommended treatment plan with your staff so that all the details are understood — from the nature of the procedures needed to the various payment options. But make sure that the next visit is appointed in a timely manner so that the patient is still motivated to participate.

Emergency patients are motivated patients. Their initial visits should include handling the emer-

gency, conveying a heavy dose of dental education, and communicating the need, if any, for follow-through on treatment.

By following all of the above steps, you will not only benefit the patient, you will ensure that your practice deals effectively with emergencies without allowing them to take over the schedule. This approach also gives your team a chance to see, on subsequent visits, what kind of patient this individual is going to be.

You can also get a sense of what kind of patient the emergency patient will be by tracking how he or she came to you in the first place. If the patient was referred to you by one of your existing patients, chances are that his or her behavior will parallel that of the patient who referred them. In other words, a referral from a regular patient usually yields a potential regular patient who is health-driven. Profiling patients allows you to safeguard your practice, and prevent everything from last minute cancellations to unmanageable accounts receivable.

Existing Patient Emergencies

Many dental teams consider treating the emergencies of existing patients as a given. And there is no doubt that some emergencies, such as dental injuries or posttreatment complications, may be inevitable. However, only a few practices track emergencies to determine what portion can be attributed to a neglect of oral health. If you're not already doing this, I suggest that you start.

Spend the next six months tracking the types of emergencies you're seeing. If you find that these situations had more to do with patients neglecting their oral health than they had to do with accidents or other "true" emergencies, you will have learned an important lesson: you could be doing a better job at controlling the incidence of emergencies by educating and motivating patients to maintain their oral health.

Determining whether there is an inverse correlation between the incidence of emergencies and the frequency of visits to your practice

is a particularly revealing exercise. If you find that your patients are not diligent in maintaining their oral health, remind your staff that patient education is ongoing and that oral health messages must be repeated at each and every visit. Your hygienist plays the lead role in the dental theatre. Words of encouragement for healthy teeth and gums are just as important as concern for neglected mouths when it comes to reinforcing the importance of dental health. It's amazing that despite an overall increase in dental awareness, some patients still don't realize that dental problems can be asymptomatic in their early stages, making preventive care very important.

Summary

Whether it's a new or existing patient who contacts your office about a dental emergency, you and your team have to handle the call with the utmost sensitivity. These patients may be in pain. They need to be treated at a practice that knows how to manage the situation, allowing them to feel relaxed and confident about the impending care.

Many new patients find that visiting a dental practice is often an unfamiliar, anxiety-provoking experience. But if you've developed a strong, effective protocol for dealing with dental emergencies, these new patients may ultimately overcome their hesitancy and become enthusiastic patients. It's all about reading and attending to their unique needs. ■

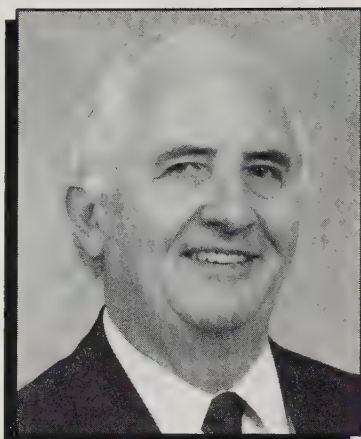
DID YOU KNOW?

Imagination was given to man to compensate him for what he is not; a sense of humor, to console him for what he is.



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Security Takes Many Forms In The CDA RSP

Dr. James Wright, President of CDSPI

When we think about what security means in an RRSP, all of us know that we want a plan that we can trust in. Our first thoughts are usually about building the best possible nest egg without taking too much of a risk. But security also means protecting the money in our RRSP against unforeseen events that could affect our investment. For example, if a CDA RSP plan holder ever had to declare bankruptcy, the money in his or her CDA RSP may be protected from creditors.

This feature was driven home recently in a significant case involving a Newfoundland dentist. When the dentist declared bankruptcy, a creditor took him to court, unsuccessfully, to try to get at the money in his CDA RSP. What makes the case significant is that it was ultimately decided in the Court of Appeal, and the creditor was Revenue Canada.

Creditor protection stems from the fact that CDA RSP funds are segregated funds, offered through life insurance companies. While they have many features that are similar to other types of investment funds, segregated funds are actually insurance contracts. This means that they fall under insurance law, which provides more protection than you'll find with mutual funds.

If someone is building a retirement nest egg through an RRSP that invests in mutual funds, and that person declares bankruptcy, creditors can go after the money in the individual's RRSP. The money would simply be unprotected. But

since segregated funds are a form of life insurance contract, your money in these funds can be exempt from seizure by creditors under provincial life insurance law — as long as you have named your spouse, parent, child or grandchild as beneficiary.

There are two types of exceptions to being "exempt from seizure." One type involves the timing of your actions concerning your RRSP — when you made contributions, and when you named your beneficiary. Any contributions made within one year of your bankruptcy (or within five years if you were insolvent when you contributed) are not exempt from seizure. Also, the funds would not normally be exempt from seizure if you named your beneficiary during the year before your bankruptcy, or when you were insolvent. In general, your funds may not be exempt from seizure if it appears that you used a segregated-fund RRSP specifically to escape creditors.

The other exception concerns segregated funds' status as a form of life insurance contract. Even though provincial life insurance law states the situation clearly, it hasn't stopped creditors from challenging the law and going after money in segregated funds. There have actually been cases where a court has ruled that money in segregated funds is not exempt from seizure by creditors. However, it is reassuring that in the only case to date in which the CDA RSP has been tested in the courts, both the trial level court and the Court of

Appeal — in a unanimous judgement — held that the dentist's funds were fully protected.

Additional Security Features

Segregated funds also provide a way of reducing the probate fees that are payable upon death. You are asked to name a beneficiary when you open your CDA RSP, because that's the person who will receive the money in your RRSP in the event of your death. (You can actually name a beneficiary at any time, and if your beneficiary is not irrevocable, you can change the beneficiary at any time.) If you do not name a beneficiary or if your beneficiary dies before you do, the money in your RRSP will go to your estate, and will be subject to probate fees.

Another advantage of the CDA RSP is that after you've been in the plan for at least 10 years, you are guaranteed a return of 75 per cent of the money you contributed to your CDA RSP. Protection of 75 per cent of the money you invest may not seem like a major advantage at first glance, but there is at least one situation where it could help considerably. For example, if the market experienced a drastic slump — or crashed — shortly before your death, your beneficiary would still be guaranteed to receive 75 per cent of the contributions you'd made to your CDA RSP.

In addition, segregated funds protect the participants' money in the event that the company that issued the insurance contract for the plan — the insurance company —

becomes insolvent. Segregated funds got their name because the money in these investment funds is fully segregated from the insurance company's other assets. Any financial problems experienced by the insurance company would not affect your money. (Money invested in the GIC Fund is not held in a segregated fund. It is invested in the two insurance companies that have issued the annuity contracts for the CDA RSP and is eligible for CompCorp protection up to a maximum of \$60,000 per insurance company.)

Creditor protection, probate fee reduction, guarantees on contributions, and protection against a plan insurer's insolvency are the basic security features that segregated funds provide. It's important to remember, however, that the CDA RSP also offers security by virtue of its age and track record.

In fact, the CDA RSP has been building the participants' personal wealth for over 38 years. It is important to note that all of the long-standing CDA RSP funds boast a 10-year average annual compound return that's above the industry average.

If you already participate in the CDA RSP, you'll find it comforting to know about the many ways that our plan provides security — especially the extra security offered by segregated funds. If you have an RRSP that invests in mutual funds, you may want to consider switching to segregated funds. The Newfoundland dentist I mentioned earlier had done exactly that. Originally, he had his RRSP with a bank, then transferred all of his funds to the CDA RSP. Thanks to that decision, his RRSP retirement savings remain intact today.

Many financial experts advise investors to consider the advantages of choosing an RRSP that puts their money in segregated funds. For dentists, we need look no further than the CDA RSP we already own.

Meet the CDA RSP Fund Managers at the CDA Convention

If you're planning to attend the CDA Convention in Ottawa, you can find out more about your CDA RSP investments from the experts who manage the plan's funds.

Representatives from Altamira Management Ltd.; Knight, Bain, Seath and Holbrook Capital Management Inc.; and Canagex Associates will be at the CDSPI booth (#221, 223) on Monday, August 28, from 10 a.m. to 3 p.m. ■

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CDA Fund	1 Year		3 Year		5 Year		10 Year	
	CDA	Other*	CDA	Other*	CDA	Other*	CDA	Other*
Aggressive Equity	-4.9%	6.4%	n/a		n/a		n/a	
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Balanced	✓ 14.1%	12.5%	8.9%	9.9%	9.1%	9.4%	✓ 9.4%	8.4%
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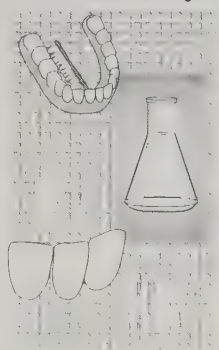
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FEATURE



Dental Amalgam: Toxicological Evaluation and Health Risk Assessment

Michael Levy, DMD, M.P.H.

Montréal Regional Board of Health

Montreal, Que.

ABSTRACT

Dental amalgam releases small amounts of mercury, which is absorbed by the body. Available data are not sufficient to indicate whether this poses a health hazard to the general population. There is an urgent need for research into the potential health effects of mercury absorption from this source. However, considering the multiple benefits of dental amalgam, unless new scientific research dictates otherwise there is currently no justification for discontinuing the use of this material. Placing a priority on the preservation of healthy tooth structure through preventive strategies and the judicious use of all restorative materials could lessen current concerns over toxicity and unnecessary treatments.

Key words: Dental amalgam, mercury, toxicity

SOMMAIRE

Bien qu'on ait démontré qu'une partie du mercure libéré par l'amalgame passe dans l'organisme, aucune étude valable n'a pu établir s'il y a ou non un risque pour la santé du public. Il est donc urgent que de telles études soient effectuées. Compte tenu des qualités indéniables de l'amalgame, et jusqu'à avis contraire, l'élimination de ce produit n'est pas recommandée pour le moment. Néanmoins, nous pouvons réduire les craintes touchant la toxicité de l'amalgame et l'administration non

nécessaire de traitements dentaires, en visant le maintien d'une structure dentaire saine par l'adoption de stratégies préventives et l'utilisation judicieuse de tout matériau de restauration, quel qu'il soit.

Mots clés: Amalgame dentaire, mercure, toxicité

Introduction

Dental amalgam containing between 42 and 54 per cent of elemental mercury has been used by the dental profession for almost two centuries. Although other types of restorative materials have appeared in the last several decades, dental amalgam has remained the most widely used material for the restoration of posterior teeth because of its ease of manipulation, its durability and low cost.

During the last few years, however, several researchers have warned that the mercury released from dental amalgam restorations may cause adverse health effects. Recent media reports have sensationalized these findings, rather than presenting balanced scientific evidence, which has raised public concern in Canada and elsewhere about the potential toxicity of dental amalgam. This concern is now widespread. Nearly half of the people who responded to a 1991 survey conducted by the American Dental Association (ADA) believed that health problems could develop from

dental amalgams.¹ Several European countries, notably Sweden and Austria, have banned the use of dental amalgam, further adding to the controversy.

In response, several national and international organizations have formed committees of experts to examine the question of whether dental amalgam restorations pose a health risk. After conducting in-depth analyses, these organizations, which include the American Dental Association, Canadian Dental Association, U.S. Public Health Service, World Health Organisation (WHO), and Swedish Medical Research Council, have been unanimous in declaring that there is no clear scientific evidence that the mercury released by dental amalgam poses a health risk.² This position has been contested by some scientists and environmental groups, who argue that it may have been influenced by predetermined concepts or by a biased scientific review.

The objective of this article is to present an objective, critical evaluation of the latest scientific data on the potential toxicity of dental amalgam.

Review of International Legislation and Recommendations

In 1994, Sweden adopted draft legislation to impose an eventual ban on the use of dental amalgam. The legislation will take effect in several stages. Starting in July

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1995, the use of amalgam is disallowed in people under 20 years of age. By 1997, dental amalgam will be completely banned. This decision appears to be founded on environmental, rather than health concerns, however. Over the past few decades, the contamination of the food chain by local industry has heightened Swedish public awareness of the environment.

In the U.S., a report published in 1992 by the Environmental Protection Agency (EPA) suggests that dental amalgam accounts for approximately 0.56 per cent of the total mercury deposited in sanitary landfills, and that it is a minor and diminishing source of this mercury.³ The same report estimates that discarded household batteries account for 90 per cent of mercury found in landfills.

Over the past several years, the use of amalgam in dental practice has been steadily decreasing. In fact, the decline in the incidence of dental caries, the advent of improved techniques, and a greater awareness of proper toxic waste disposal all contributed to a considerable reduction in the amount of amalgam waste produced in the dental operatory. It could therefore be assumed that the dental amalgam present in landfills and in sewer sludge is largely left over from a bygone era.

In Germany, the Federal Health Agency (BGA) recently proposed some important restrictions on the use of dental amalgam. It now recommends that dental amalgam should not be used on persons with renal problems. Similarly, it suggests that alternatives to amalgam should be carefully considered in children under six years of age, and particularly in those under three, since sensitivity to mercury is said to be highest in these early age groups. It also recommends that major dental procedures involving amalgams should be avoided during pregnancy, since inhaled mercury vapor crosses the placenta. This recommendation was made to prevent the unborn child (fetus) from being subjected to additional mercury exposure during the time of its greatest development.

Although the BGA asks dentists to observe these recommendations in the interest of preventive medicine, it states that "according to the latest status of scientific knowledge, there appears to be no evidence that amalgam is hazardous to one's health."⁴ This same agency has also withdrawn gamma-2 amalgam from the market, primarily because of its poor physical properties. This product is only rarely used in Canada.

Despite its recommendations, the BGA has not advocated the systematic removal or replacement of amalgam restorations unless there is evidence of allergic reactions.⁴

Intake, Excretion and Measurement of Mercury Exposure

Mercury is found in three distinct forms in the environment. Organic mercury (methylmercury) is the predominant form in the human diet, and is found most often in seafood and fish. Inorganic mercury is also found in food, but to a lesser extent. By contrast, elemental mercury, the type used in dental amalgam, is almost nonexistent in nature. In fact, exposure to elemental mercury almost always results from human activities.

In humans, methylmercury is mainly excreted in the feces, whereas elemental and inorganic mercury are excreted in the urine. As a result, determining the level of mercury in the urine can help in evaluating whether exposure to elemental mercury from dental amalgam has occurred.

Earlier studies of mercury exposure from amalgam restorations reported on total blood mercury. These data blur the distinction between mercury exposure from all sources, that is, inorganic and elemental mercury from amalgam restorations, and organic mercury (methylmercury) from dietary exposure. Such studies do not allow for the relative contributions of mercury uptake from amalgam restorations and dietary exposure to be determined.²

Health Effects Associated With Mercury Exposure

The toxicity of mercury has been recognized since antiquity. Signs and symptoms associated with elemental mercury intoxication include tremor, ataxia, personality changes, loss of memory, slowed nerve conduction and other neurological impairments. These symptoms are usually associated with long-term occupational exposures to mercury air concentrations of greater than 50 $\mu\text{g}/\text{m}^3$. However, a study of workers exposed to a time-weighted average air concentration of 26 $\mu\text{g}/\text{m}^3$ of elemental mercury for an average of 15 years has shown an increase in intentional tremor.⁵ (Intentional tremor is a tremor, usually of the hand or arm, induced by applying a light load. It is one of the many tests that are used to detect early damage of the central nervous system.)

Using an exposure value of 26 $\mu\text{g}/\text{m}^3$ as the lowest observed adverse effect level (LOAEL), the U.S. Agency for Toxic Substances and Disease Registry (ATSDR)⁶ and the EPA have suggested that 0.3 $\mu\text{g}/\text{m}^3$ represents the highest mercury air concentration to which a person can be continuously exposed with a low probability of harmful effects. This is roughly equivalent to a daily uptake of about 4.8 μg of mercury.²

Based on current scientific evidence, it is impossible to determine if there is a lower or higher level of exposure at which mercury is not toxic, or if mercury follows the heavy metal paradigm, and has no identifiable exposure threshold.² According to a 1993 report on amalgam published by the U.S. Department of Health and Human Services, no scientifically-acceptable studies have shown adverse mercury-related health effects in non-occupationally exposed persons. However, the possibility of such effects cannot be fully discounted given the limitations of existing data. And if such effects do exist, they may include subtle neurological or behavioral changes that are extremely difficult to detect.²

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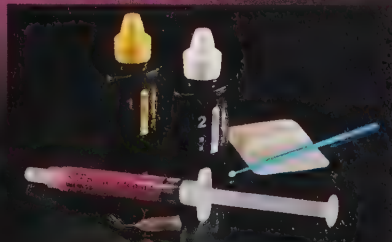
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Table I**Estimates of average daily uptake of mercury from amalgam restorations²**

Principal author	Number of surfaces	Mercury ($\mu\text{g/day}$)
Patterson (1985) ¹⁰	not available	27.0
Langworth (1988) ¹³	8-54	3.0
Berglund (1990) ¹¹	13-48	1.7
Vimy (1985) ¹⁴	1-16	19.8
Clarkson (1988)* ¹⁷	not available 1-16 not available not available not available	17.5
Svare (1981)		2.9
Vimy (1985)		4.4
Abraham (1984)		2.5
Patterson (1985)		
Mackert (1987)* ¹⁵	1-16	1.24
Vimy (1985)		

* According to the author's evaluation of these data.

Intraoral Mercury Vapor Measurement

Until recently, the physically-bound mercury contained in dental amalgam was thought to be inert. During the past decade, however, more sensitive analytical methods have shown that higher mercury vapor levels occur in the oral cavity when amalgam fillings are present.⁷⁻⁹ These levels increase proportionally with the number of amalgam surfaces. Similarly, when stimulated by chewing or brushing, mercury levels increase eight to 15-fold over the resting levels. They are also substantially higher during the placement and removal of amalgam restorations.⁷⁻¹³

Various studies have recorded resting intraoral mercury vapor levels ranging from between 0.26 $\mu\text{g/m}^3$ and 6.0 $\mu\text{g/m}^3$ in subjects with amalgams, but these levels rose to between 13.7 $\mu\text{g/m}^3$ and 56.4 $\mu\text{g/m}^3$ following chewing or brushing.^{9,13,14}

Based on these results, the total daily absorption of mercury from dental amalgam is thought to vary from 1.24 $\mu\text{g/day}$ to 27 $\mu\text{g/day}$ (Table I). However, because of questionable experimental design, the highest estimate — 27 $\mu\text{g/day}$ — is probably a six-fold overestimate.¹⁵ Following extrapolation of available data, it is now estimated that the total daily mercury dose is 1.0 to 5.0 μg higher in subjects with seven to 10 amalgams than in those with no amalgams.²

Although some of the mercury vapor released from amalgam is expired, the rest is inhaled and absorbed rapidly by the body. The ingestion of amalgam particles produced through abrasion or during the placement and removal of amalgam fillings can also result in gastro-intestinal absorption of mercury, as will the ingestion of saliva that contains dissolved elemental- and corrosion-produced inorganic mercury products.¹⁶

Mercury Levels In Blood and Urine

Several studies have demonstrated the effect of amalgam restorations on the mercury levels found in body fluids such as blood and urine. Abraham et al² measured the blood mercury levels in subjects with and without dental amalgams. The mean morning baseline mercury blood levels were 0.7 $\mu\text{g/L}$ and 0.3 $\mu\text{g/L}$, respectively. Snapp et al¹⁸ compared the blood mercury levels of subjects before and after their dental amalgams were removed. The initial levels were found to correlate with the number of occlusal surfaces and the number of amalgam fillings (mean = 2.18 $\mu\text{g/L}$). One to four months following removal of their amalgams, the subjects' mean mercury blood levels had dropped to 1.05 $\mu\text{g/L}$. Other studies that measured mercury levels in urine found that subjects with dental amalgams had mercury urine levels three to six times higher than those without amalgams. Again, mercury

levels correlated with the number of fillings present.¹⁹⁻²¹ Results from studies measuring mercury levels in urine vary significantly, ranging from means of 0.58 $\mu\text{g Hg/g creatinine}$ to 3.4 $\mu\text{g Hg/g creatinine}$ for subjects with amalgams, and 0.17 $\mu\text{g Hg/g creatinine}$ to 0.27 $\mu\text{g Hg/g creatinine}$ for those without amalgams. The highest level reported in the literature, 12.7 $\mu\text{g Hg/g creatinine}$, was found in a subject with 82 amalgam surfaces (an amalgam crown was counted as six surfaces), and represents a daily uptake equivalent to 70 μg of mercury.²¹

The occupational exposure limit of 25 $\mu\text{g/m}^3$ (eight-hour time-weighted average) for elemental mercury, as proposed by WHO, corresponds to a mean urinary excretion of about 30 $\mu\text{g Hg/g creatinine}$, and is consistent with a systemic uptake of mercury of 175 $\mu\text{g/day}$.²¹ A urine mercury level of 50 to 100 $\mu\text{g Hg/L}$ (50 $\mu\text{g Hg/g creatinine}$) is usually associated with symptoms of toxicity.

Mercury Uptake In Organs

Mercury vapor is absorbed rapidly by the bloodstream, distributed to all major organs, and deposited mainly in the brain and kidneys.²² Animal data show that the amount of mercury in the brain is about 10 times higher following an exposure to elemental mercury vapor than it is following an exposure to inorganic mercury.^{23,24} Elemental mercury can also cross the

placenta to be retained in fetal tissues.^{25,26} Two studies have compared, at autopsy, the levels of total mercury in the occipital lobe of subjects with and without amalgams.^{27,28} Mercury levels were 2.5 to 2.9 times more elevated among those with amalgams, and the total mercury level in the occipital lobe correlated significantly with the number of amalgam surfaces.²⁸

Nylander et al²⁹ compared tissue mercury levels from the occipital lobe, pituitary gland and renal cortex of eight dental staff workers and 27 control subjects. The mercury levels found in pituitary gland were 35 times higher for dental workers than for control subjects (815 ng/g vs 23 ng/g), 1.7 times higher in occipital lobe (17.0 ng/g vs 10 ng/g), and 8.5 times higher in their renal cortex (1,528 ng/g vs 180 ng/g). Nylander²⁸ also compared the levels of mercury in the renal cortex of seven subjects with amalgams to those of other subjects without amalgams. Mercury levels were nine times higher in the subjects with amalgams.

Laboratory Animal Studies

Studies performed on laboratory animals have shown that mercury from dental amalgam accumulates in various tissues.^{30,31} These results must be interpreted with caution for several reasons:

- 1) the animals are usually followed briefly following amalgam placement;
- 2) the masticatory function and diet abrasiveness of animals are not comparable to those of humans; and
- 3) the mercury distribution in the organs appears to indicate gastrointestinal rather than pulmonary absorption.

The relevance of animal studies to humans is therefore questionable.²

Potential Health Effects of Dental Amalgam On the Population

Recently, some isolated studies have suggested a link between dental amalgam and cardiovascular³² and psychological problems such as depression, anxiety, and

increased smoking habits.^{33,34} Because these studies tested too few subjects, lacked sufficient controls, and may be experimentally biased, their findings must be interpreted with extreme caution until, and only if, they are replicated by other investigations. There also appears to be no persuasive scientific evidence to support recent claims that the mercury absorbed from amalgam may compromise the immune system.³⁵

Potential Health Effects On Dental Staff

Dental professionals are exposed to higher levels of mercury from amalgam than the general population. It follows, therefore, that they should be the first group to show the signs and symptoms of toxicity. Nevertheless, several studies have shown no differences in health status among dental professionals and the general population.^{36,37}

However, in 1982 Shapiro et al³⁸ published the results of a well-designed and well-executed investigation that suggested a possible link between cumulative mercury exposure and neurological problems. The study involved 298 dentists. It found that dentists with higher tissue mercury levels have increased polyneuropathies, and reported more psychological distress symptoms than those in the control group. It should be noted, however, that this study was conducted over a decade ago, when amalgam use was more extensive and proper mercury hygiene measures were not as well implemented.

Hypersensitivity

It is recognized that a small proportion of the population may exhibit allergic reactions to the mercury in amalgam. From 1905 to 1985, only 41 cases of amalgam allergy were reported in the scientific literature.³⁹ Most of these cases involve skin reactions, such as rashes and eczematous lesions, which may be localized or occur at a distance from the initiating site, and appear two to 24 hours after the amalgam was placed.

Mercury Levels In Body Tissues of Patients With Alzheimer's and Parkinson's Disease

Investigators have found elevated mercury concentrations in the brains of patients with Alzheimer's disease, and in the blood, urine, and hair of patients with Parkinson's disease.^{40,41} The sources of the mercury found in these patients are unknown, and no causal relationship has been demonstrated between Alzheimer's or Parkinson's diseases and the presence of mercury in body tissues.

Estimated Daily Absorption of Mercury In the Population

As mentioned, the daily level of mercury vapor to which a person can be continuously exposed with no harmful effects, according to the EPA and the ATSDR, is 0.3 $\mu\text{g}/\text{m}^3$, which corresponds to a daily uptake of approximately 4.8 μg .² Research data suggest that the average daily mercury uptake for subjects with seven to 10 amalgams is between 1.0 to 5.0 μg , although individuals with a high load of amalgam may be exposed to levels that greatly exceed the ATSDR level. As we described previously in this article, one subject with a very high level of amalgam (82 surfaces) was estimated to have a mercury uptake of 70 $\mu\text{g}/\text{day}$, which may in fact not be too far from the occupational uptake limit set by WHO of 175 $\mu\text{g}/\text{day}$.⁴¹ It should also be noted that occupational limit values are usually based on an estimated 20 year workplace exposure. By contrast, dental amalgams may be present in the mouth for much longer periods. The total mercury contributions from all other sources (diet, water, air) have been estimated to be 2.3 to 5.8 $\mu\text{g}/\text{day}$.^{42,43} From the preceding discussion, it can be concluded that exposure from dental amalgam is a significant part of the total uptake, and according to some investigators, it is the largest source of mercury in persons without occupational exposure.^{44,17}

Discussion

The toxic effects of mercury at the concentrations found in the workplace have been well docu-

mented.²² However, there is no persuasive evidence that serious adverse health effects can be attributed to the much lower levels of mercury released from dental amalgams. If such symptoms are present, they may be so vague and non-specific that they are extremely difficult to detect by conventional means.²

In the absence of such clear evidence, it is impossible to conclude whether health hazards exist. Nonetheless, the potential for toxicity, especially in more sensitive individuals, should not be disregarded.² After a review of the literature, and because of the paucity of available information, it is clear that there is an urgent need to develop appropriate research protocols to clarify the effects, particularly those of neuro-psychological nature, of long-term mercury exposure from amalgam fillings. Research should be conducted to characterize the potential for adverse effects in groups of the population that may be more at risk, such as very young children, pregnant women, the elderly, persons with renal problems, those with large numbers of amalgams and/or deteriorating restorations, and occupationally-exposed dental professionals.²

Considering the multiple benefits of dental amalgam, it would be currently inappropriate to recommend the elimination of amalgam as a restorative material or the replacement of existing restorations. However, it should be stressed that dentists must use all the means available to them to minimize workplace exposure and environmental contamination.

The main intent of this article was to focus on the potential toxic health hazards from dental amalgam. However, there are equally important concerns — which should not be disregarded — about adverse physical effects resulting from the unnecessary placement or replacement of amalgam fillings, primarily the preventable damage to healthy tooth structure.

Despite compelling evidence that early carious lesions can be arrested or reversed by non-invasive therapies such as sealants and fluoride or chlorhexidine regi-

mens, dentists continue to "treat" these lesions using aggressive operative protocols developed almost a century ago,⁴⁵ which involve the removal of much healthy tooth tissue.⁴⁶ However, once a restoration is placed, it will almost invariably lead to a cycle of restorative breakdown and replacement with a progressive loss of tooth integrity.

Dentists can greatly reduce the non-essential use of dental amalgam by adopting diagnostic and treatment strategies based on tooth structure preservation through the use of available preventive therapies.⁴⁵ The best restoration is the one that is never needed. If the first priority is the preservation of healthy teeth, the use of any restorative material would be limited, and concerns over toxicity, amalgam replacement, and unnecessary treatment would be greatly reduced. ■

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Dr. Michael Levy is a dental consultant for the Montreal Regional Board of Health.

Reprint requests to: Dr. Michael Levy, Montreal Regional Board of Health, 4835 Christophe-Colomb St., Montreal, Qué. H2J 3G8.

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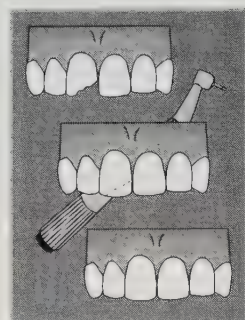


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RESTORATIVE DENTISTRY



Ceramic Inlays And Onlays: Update 1995

John N. Nasedkin, DDS, MRCD(C),

ABSTRACT

Tooth-colored inlays and onlays are increasingly sought by the public because of a growing interest in restorations that appear natural, and because of concerns about mercury in amalgam fillings.

Following the introduction of bonded porcelain inlays in 1985, many of these restorations were placed. These inlays were a natural sequel to the porcelain laminate that reached North America in 1984, yet they did not enjoy the same rate of success.¹ The advent of industrially fabricated porcelain blanks and the ability to copy-mill a positive as an inlay or onlay has resulted in a reliable and predictable dental restoration. Pressed ceramics, which are modelled by wax pattern, are also effective tooth-colored restorations.

SOMMAIRE

Les gens demandent de plus en plus des incrustations et des incrustations à recouvrement (inlays et onlays) ayant la teinte des dents parce qu'ils veulent des restaurations qui paraissent naturelles et qu'ils s'inquiètent du mercure contenu dans les obturations à l'amalgame. Après l'apparition des incrustations liées à la porcelaine en 1985, on a effectué de nombreuses restaurations suivant ce procédé. Cette innovation faisait naturellement suite aux facettes de porcelaine commencé en 1984 en

Amérique du Nord, mais sans le même succès.¹ L'apparition de la porcelaine machinée à partir de blocs de porcelaine pré-fabriqués a permis l'élaboration d'incrustations solides et fiables. La céramique pressée, coulée à partir d'une maquette de cire, donne également de bonnes restaurations ayant la couleur des dents.

History

Following the failure of many of the porcelain/ceramic restorations during the mid 1980s, we saw the advent of the California inlay/onlay (Fig. 1). A non-precious metal substrate was cast, fitted to a refractory die and then fibre-filled porcelain was added and the porcelain superstructure was completed. This was an attempt to improve the strength of the restoration by using porcelain fused to metal technology.

Improved Foundations

In the early days of contemporary porcelain inlays (1985), the recommended procedure for basing preparations was the use of glass ionomer cement such as GC Lining Cement. Unfortunately, this cement had a very low compressive strength and, as a result, there was inadequate support under the inlays. A useful analogy is to think of a tile floor placed on sheets of plywood with few joists underneath. The tiles would crack as the floor flexed.

Foundations have evolved from the higher compressive strength glass ionomer cements that were recommended in 1988,² to light-cured glass ionomers in 1992, and to composite resins (directed shrinkage) in 1993. These materials approximate the compressive strength of dentin. In 1993, Scherrer et al reported on the high fracture strength of restorations made on a foundation of a high modulus material.³

Appropriate Amounts Of Porcelain

When the porcelain of an inlay/onlay is too thin (less than 1 mm) in a stress-bearing area, a fracture could occur as a result of stress concentration. Porcelain thicker than 1.5 mm is also at risk for shear fracture especially in marginal ridge areas. Since it is a case of either too little or too much, the preparation design is critical to success. In addition, it should be remembered that porcelain cannot be fired to a knife-edge or feather edge. Preparations that are similar to gold onlays with bevels are destined to fail.

Principles Of Preparations

Roulet's⁴ book *Bonded Ceramic Inlays* — which was originally published in German in 1989 — is the standard reference on this subject. Almost every preparation diagram and technique documentation uses part of the work on Dicor inlays from this publication.

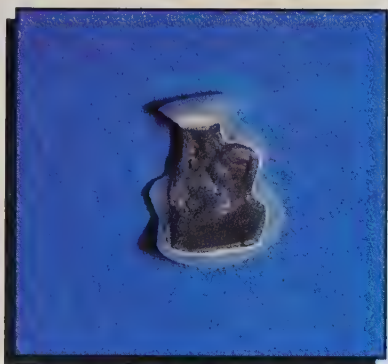


Fig. 1: California inlay with metal substrate.



Fig. 2: Polishing using the Premier Two Stripper MPS system with RA collet and rotary polishing tip plus diamond paste of the occlusal surface of ceramic inlay on 4.7 with California inlay on 4.6.



Fig 3: Premolar alloys requiring replacement. Note gold second molar restoration and Willi glass inlay in first molar from 6/91.

In 1990, Banks⁵ provided an excellent review article, with good illustrations of preparations and commentary regarding most posterior ceramic systems. He points out that sharp margins and bevels create thin sections of brittle porcelain and should be avoided. He also indicates that grooves and surface characteristics must be made shallow and that precise occlusal contacts are difficult to obtain.

Preparation Design

Ceramics make excellent inlays and onlays, yet the marginal integrity of these restorations is not always maintained over time. Margins should avoid areas of heavy occlusal function, and should be carried over the cusp and into a non-stress bearing area any time that the margin is near to the cusp tip.

Machinable Ceramics

Most dentists are unaware of the differences between a ceramic and a porcelain. The primary essential is that a ceramic is heat-treated in order to influence crystalline growth in the glass-like material, which alters physical properties. Dicor has tetrasilicic fluoro-mica crystals that are designed to reduce crack propagation.

Machinable dental ceramics are attractive because their high strength allows for a restoration design that fills the entire cavity preparation. Naturally, the assumption is that effective dentin bonding agents and luting agents will be used.

The Cerec unit for milling machined ceramics was the first practical CAD/CAM unit in dentistry. In the late 1980s, it also introduced Dicor MGC and Vita industrially-manufactured porcelain as machinable ceramics for the dental market. Principally, this technique involved the acquisition of an optical image of a preparation and the use of a rotating diamond disk to mill an inlay or onlay. Although a later generation of the machine used an electronically driven disk⁶ few of these machines were sold in Canada. Nonetheless the ceramic blocks were of interest because of their excellent physical properties.

The new CEREC 2 will reach the North American market late this year, with many improvements in CAD/CAM technology, but with little alteration in the ceramic blocks. The single disk is supplemented with a cylindrical burr and even veneers can be milled. Software program changes will make crown fabrication a possibility in the not-too-distant future. The clinical accuracy of the new unit is in the range of 37 to 76 microns of interfacial gap.

The flexural strength of Machined Dicor MGC is 220 MPa, and Cerec Vitablocks at 150 MPa. Machined ceramics have been compared to enamel in tooth abrasion studies. With surface characteristics that are maintained over time, these ceramics are destined to be long-lasting posterior tooth-colored restorations.

The Copy Milled Inlay : (Celay)

Dr. Stefan Eidenbenz, University of Zurich, developed the eight-axis milling machine, Celay — which can be likened to an extremely accurate and more versatile key-cutting machine. This product has been available in Europe since Sept. 1991, and Eidenbenz introduced his idea to North America⁷ in Chicago in Feb. 1992.

By the fall of 1993, Celay was being marketed in North America, and the first unit was installed in Canada at a large commercial laboratory in Calgary. While the unit is manufactured in Switzerland, service and technical support comes from North American Vident, the Vita representative company located in Brea, California.

The approach that is currently recommended is a direct-copy milled restoration, which usually requires a two-visit format and a temporary in the interval. In Europe, many dentists make the pattern directly in the mouth and carry out the copy-milling on site, consequently avoiding the need for temporization.

Steps:

1. Pre-inlay;
2. Copy milling;
3. Insertion;
4. Finishing.

After the tooth is prepared for the inlay/onlay, a separator film is applied and a PRE-INLAY is made. This is a precision composite ma-

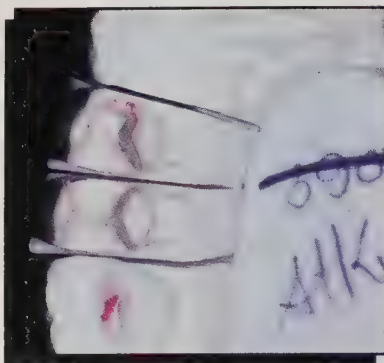


Fig. 4: Master dies of preparations on 1.4 and 1.5 with shoed palatal cusp.

terial with two phase hardening, which can be sculpted in the mouth. A thin acetate matrix band is used below the contact point, allowing for solid contact to the adjacent tooth as well as for occlusal contact establishment.

After moulding, the occlusal surface is light-cured and the inlay form is used as a blank for the copy milling — taking only a few minutes to produce an approximate form. The pre-inlay is then coated with a tracing medium powder for a more accurate final milling which takes six to 12 minutes and is designed to produce 50 micron constant gaps.

Ceramic blocks of Vita porcelain are made of industrialized fine (4 micron) grain porcelain containing 20 per cent alumina. The block is very translucent and available only in shades A2 and A3, which can be custom stained or tinted. The material is much stronger than conventional porcelain and has little tendency to abrade natural tooth structure. Different cutting tools can be selected — primarily disc, cone and cylinder, which enable the occlusal configuration developed in the pre-inlay to be readily duplicated.

A laboratory approach is quite feasible for multiple restorations or for those of a more complex nature. Dies are made, and a more heavily-loaded pre-inlay material is used for the positive for copy milling. The technician can use a ceramic/wax combination for additions/corrections, and can stain and tint the restoration. Vident are teaching a silver-plated die tech-

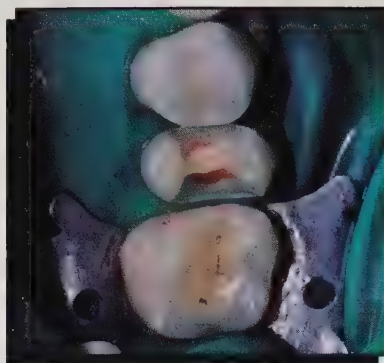


Fig. 5: Celay inlay in shade A2 is cemented first on 1.4.

nique as well as stone die approach.

Siervo⁸ has shown that the most accurate Celay restorations are produced by modelling the pre-inlay in the mouth. Insertion requires etching of inlay inner surface, silane coupler and a dual cured composite luting agent.

Celay Alumina Blanks

In late 1993, Celay Aluminum blanks became available for the milling of substructures for the Vitadur Alpha porcelain. Essentially this becomes a quicker method of making an In-Ceram Alumina crown.⁹

Limitations of CAD/CAM and Copy-Milled Restorations

Machinable ceramics have restorative limitations that are based on the limitations of the machines to reproduce restorative designs. With Cerec, the inability of the cutting disk to carve into re-entry angles makes it essential that the dentist-user is specifically trained in restorative design. Celay is unable to duplicate long chamfers with accuracy, and an extremely thin preparation is contraindicated. While the cost of a ceramic restoration is comparable to similar restorative services, the Cerec unit itself is expensive and the Celay unit involves moderate capital cost.

Empress — A Leucite Reinforced Ceramic

Another wonderful product from the University of Zurich and Arnold Wohlwend is Empress, a



Fig. 6: Two completed Celay restorations blend into the adjacent tooth structure.

pressed ceramic.¹⁰ Ivoclar/Williams introduced this product — which had been available in Europe for almost two years — to North America during the late fall of 1991. It is a complete system for either substrate crowns or superficially shaded crowns and for superficially shaded inlays and onlays.

A full-contour wax-up is made and invested in a special investment. The Empress material is then heat-pressed into the investment and subsequently stained, colored and glazed. This means that an inlay or onlay can be waxed conventionally and the problems of trying to build porcelain on refractory dies are avoided.

In the ceramic, leucite crystals develop radial stress which reduces micro-crack propagation. The leucite crystals are well dispersed in a glass matrix.

A new *Chromascop shade guide* is very well designed to work with the system, and should soon enjoy more universal acceptance. For more complete esthetic control, the color of the dentin is determined at tooth preparation with a second shade guide for Stumpf material (or die material). After the substrate has been pressed, the technician is able to model a die in the dentin color for a more faithful color rendition.

For anterior crowns and veneers, a colored substructure is made and superficial portions are cut back as needed for translucency or color build-up. Porcelain is layer-fired on the substrate, and then glazed with a compound of 50 to 60 micron thickness that has

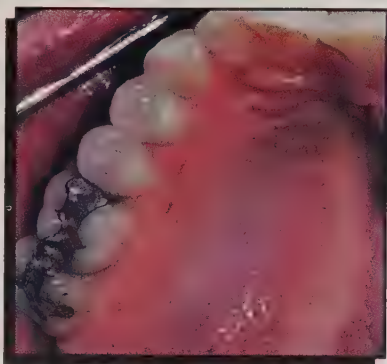


Fig. 7: Premolars in Empress.

the same components as the base material. Inlays use a translucent substructure and surface coloring and glazing.

Krecji¹¹ in simulated long-term wear studies reported that wear of Empress was almost identical to enamel. Over the five-year simulation, the Empress inlays were good on the enamel and poor in cervical areas, probably because the ceramic transfers occlusal forces to the margins. Some marginal breakdown occurred at tooth-cement and cement-inlay interfaces and the resin cement was selectively worn. In 1993, the microfill DUAL cement was replaced with VARIO-LINK, a more heavily filled luting agent.

In terms of physical properties, Empress has adequate strength and very good marginal fit. Empress is a good material to use in the anterior regions where a combination of needs are present, such as an inlay, a crown and/or a veneer. This makes for a simplified process using the same material for a variety of situations.

Cementation Of Porcelain/Ceramic Restorations

Dentin Bonding Agents

Almost all of the dentin bonding agents now available are designed to accommodate the insertion of indirect restorations with minimal film thickness of material.

Manufacturers routinely provide specific instructions for all applications. Many of the Bowen formula agents contain a tertiary amine which accelerates the set of

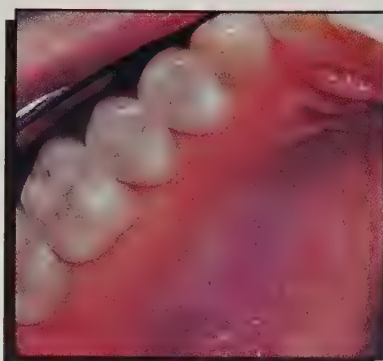


Fig. 8: Celay restorations placed on molars.

chemically cured luting agents. For this reason it is best to coordinate the DBA with cements from the same manufacturer.

Cementation Steps

1. Secure anesthesia.
2. Remove the temporary restoration and place a rubber dam.
3. Clean the cavity preparation — ideally with intra-oral sand-blasting.
4. Trial fit — if the inlay does not seat, check inside the preparation for residue of the temporary cement.
5. If you use fit-checker, you must coat both the tooth and the inlay with saliva on a pellet as a separating medium — otherwise the silicone will adhere to the etched internal. Silicone residue must be removed as for try-in materials below.
6. Relieve undercuts on the tooth rather than on the inlay. You must use acid etch or acetone to clean the inlay as indicated below to remove silicone residue.
7. If using a try-in paste for color determination, do the try-in, then, when shade of cement is confirmed, cleanse the inlay in acetone or methylene chloride, wash thoroughly, dry, apply silane coupling agent to etched surfaces and dry with heated air.
8. Etch the tooth, and apply dentin bonding agent of choice.
9. Ensure approximating surfaces will not bind by coating with



Fig. 9: A Profin reciprocating handpiece tip is used to finish the distal proximal surface of an inlay on 3.5.

Lanolelle or by using shim stock matrix as separator.

10. Mix cement and apply cement to internal of preparation.
11. Insert the inlay with an orange-wood stick and maintain continuous seating pressure.
12. Seal margins with unfilled resin brushed at right angles to the margin. The occlusal of tooth/inlay can be coated with glycerin or similar materials like De-Ox (Ultradent).
13. Light cure into place.
14. Remove excess cement with no. 12 Bard-Parker scalpel blade.
15. Trim and refine occlusal margins with fine football-shaped diamonds and the proximal margins with Profin reciprocating handpiece fine finishers (**Fig. 9**). (Profin reciprocating handpieces are available from Weissman Technology, 192 Lexington Ave. Room 901, NYC 10016 phone (212) 481-1010.)
16. Remove dam. Check and adjust occlusion with progressively finer diamonds.
17. Polish with Premier Two Stripper MPS polishing system.

A further 90 or more seconds of light curing is applied to each inlay to assure complete polymerization and maximum hardness, even for dual-cured resin cements (**Fig. 2**).

Cements

The current generation of cements have been developed with higher viscosities in an attempt to reduce wear at the margins and to perform more like posterior composite materials.



Fig. 10: Premolars before restoration with Empress inlays.

The 3M Opal Luting Composite, formerly known as the Indirect Cementation System, has the advantage of three opacity levels — low medium, and high — which may be used to block underlying stain or discoloration and to affect an increase in brightness (value), which may be of use with the A3 Celays.

Glycerin on the occlusal margins prevents the formation of an air-inhibited layer, and may lead to improved wear resistance of the composite at the interface. Shofu's Imperva Dual kit has an Oxy-Barrier as an air barrier agent.

Sono-Cem (Espe Premier), introduced in 1992, becomes free-flowing when exposed to ultrasonic energy transmitted by a



Fig. 11: 2 Empress inlays and PCR with beta quartz on 1.6.

metal tip in contact with an acetate strip on the restoration. The cement is placed into the cavity preparation using a Centrix syringe. The use of shim stock or a transparent matrix band around the tooth prevents excess cement accumulation on the margins.

A University of Alabama study¹² compared gap widths and resin cements for tooth-colored inlays and reported that gap size was quite variable, and that most wear at the interface occurs in the first year. The depth of the interfacial gap which develops due to wear was around 40 per cent of the width of the gap, and hybrid cements wore more than microfills. It is speculated that the larger particles of the hybrids tend to be dis-

lodged or plucked from the surface as food is chewed. With preparation designs for onlays carrying the margin to non-functional surfaces, gaps develop much more slowly.

Preferences

For second molar onlays and inlays, the author personally prefers cast gold restorations, tin-plated and adhesively bonded to place. In first molars I am comfortable with Celay inlays and onlays when tooth-colored restorations are requested. In premolars Empress is excellent for inlays and when color match is critical. Celay works well in premolars for onlays.

Occlusal staining appropriate to age and to the remaining tooth structure is highly recommended for maximum matching to the dentition.

Other Materials

In the porcelain/ceramic continuum, many other tooth-colored restorations are currently available. In-Ceram Spinell uses Vita Alpha porcelain and a translucent substrate. Fortress is a new leucite-based porcelain from the makers of Mirage/Chameleon. Ducera LFC is a low-fusing hydrothermal glass with a ceramic substrate. The cementation principles outlined above also apply to these materials.

Outlook

Improvements in materials over the past 10 years have not resulted in increased use of ceramic inlays and onlays. The principal reason is that these services are not usually covered by dental benefits. Nonetheless as longevity of ceramic inlays improves, dentists are encouraged to include them as alternatives for Class I and II restorations, especially in visible teeth, since patient acceptance is so positive. ■

TABLE I

Dentin bonding agents and companion luting cements

	Sono-Cem (ESPE-Premier) (78 per cent)
Scotchbond MPA Plus	3M Opal Luting Composite (82 per cent)
Syntac	Vivadent Vario-link
	high (inlays) (76 per cent)
	low (veneers) (72.5per cent)
	Ultra viscosity (Sonic) (78 per cent)
ED Primer	Panavia 21 tooth-colored (77 per cent)
All-Bond 2	Duo-Link for inlays (67 per cent)
	Choice (Bisco) (79 per cent) Pre-bond resin is essential
ABC Enhanced	Mirage FLC kit (72 per cent)
ProBond	EnForce (Caulk) (70 per cent)
Imperva Bond	Imperva Dual (Shofu)

Dr. Nasedkin is a certified specialist in prosthetic dentistry in Vancouver, B.C., and the mentor of several esthetic study groups known as TEST — The Esthetic Study Team.

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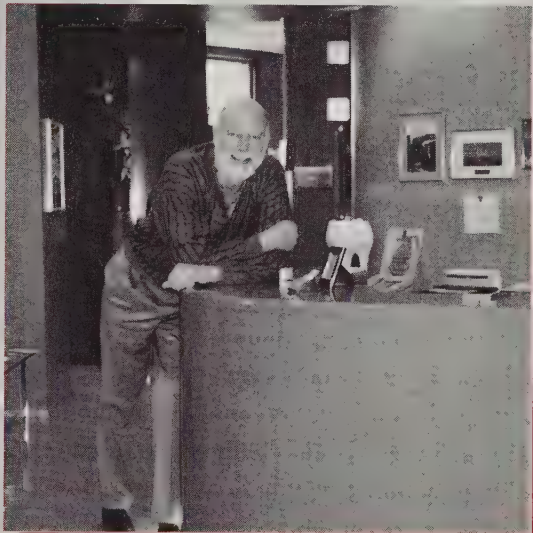
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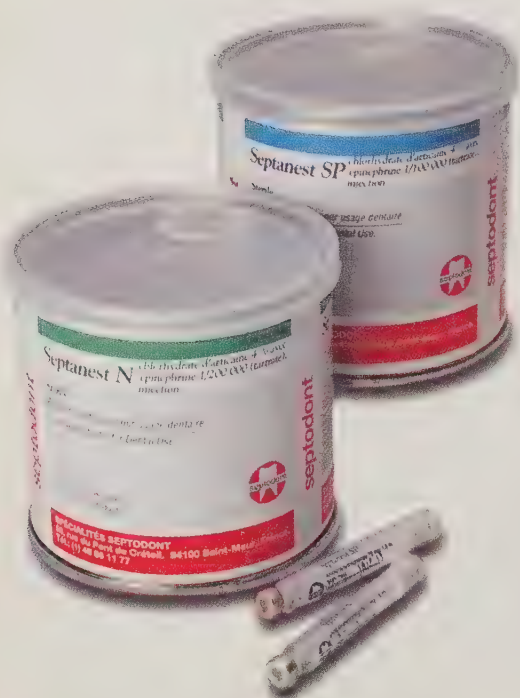
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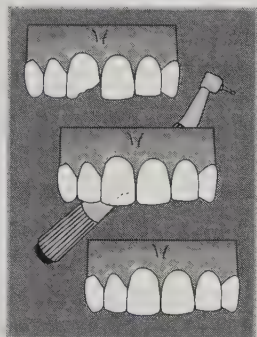
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RESTORATIVE DENTISTRY



Factors To Consider For Predictable Post And Core Build-ups Of Endodontically Treated Teeth Part I: Basic Theoretical Concepts

K.E. Manning, B.Sc., DDS, MS

D.C. Yu, BS, DMD, M.Sc.D.

H.C. Yu, BS, DDS, M.Sc.D.

E.W. Kwan, BS, DDS

ABSTRACT

Post and core build-ups represent an important pre-prosthetic procedure prior to the restoration of an endodontically treated tooth. The dental practitioner is presented with the dilemma of selecting from an ever increasing variety of materials, techniques and designs related to this procedure, many of which are harmful and mired in controversy. Part I of this paper reviews some basic theoretical concepts for the dentist to consider when producing a predictable post and core build-up. An understanding of these basic concepts will assist the dentist in gathering data and establishing a risk/benefit equation, and will also provide an additional aid during the decision-making process for the restoration of an endodontically treated tooth.

SOMMAIRE

Avant la restauration d'une dent ayant fait l'objet d'un traitement d'endodontie, le montage des tenons et du noyau représente une importante procédure préprothétique. Le praticien dentaire est placé devant un dilemme et doit choisir parmi une variété de plus en plus grande de

matériaux, de techniques et de conceptions liés à la procédure, dont plusieurs sont dangereux et dénigrés par la controverse. Dans la première partie de cet article, on revoit certaines notions théoriques de base que le dentiste doit prendre en considération en produisant le montage des tenons et du noyau. S'il comprend bien ces notions, il pourra recueillir des données et mettre en équation les risques et les avantages. De plus, il aura des moyens de plus pour prendre des décisions touchant la restauration d'une dent ayant fait l'objet d'un traitement d'endodontie.

Introduction

Post and core treatment is considered a basic pre-prosthetic skill in fixed prosthetics and often serves as a foundation for many restorative treatment plans. It is disturbing to read statements such as: "In the last decade, new research has shown that traditional methods for restoring pulpless teeth are not just outmoded, but in many cases actually promote tooth breakdown."¹ Currently, the reality remains that many of our post and core treatments are harmful. Another reality is that, the guide-

lines for post and core treatment are mired in controversy. At present, clinical dentists are faced with a multitude of divergent techniques, designs and dental materials from which to choose and the rationale or logic for many of their selections remains dubious and confusing. Part I of this paper reviews the basic factors to consider for predictable post and core build-ups. An understanding of these basic factors will assist the dentist in clinical data gathering and aid in establishing a risk/benefits equation for the restoration of endodontically treated teeth.

Endodontically Treated Teeth Are Different

Patient data collection and diagnostic phases routinely establish the restorability of a tooth. As a pre-prosthetic procedure, selected teeth often require endodontic treatment and a post and core build-up. Current endodontic procedures are highly successful at preserving badly broken down teeth, but prior to the build-up, an essential initial factor for the restorative dentist to consider is that the dentin-root complex of that endodontically treated tooth will be

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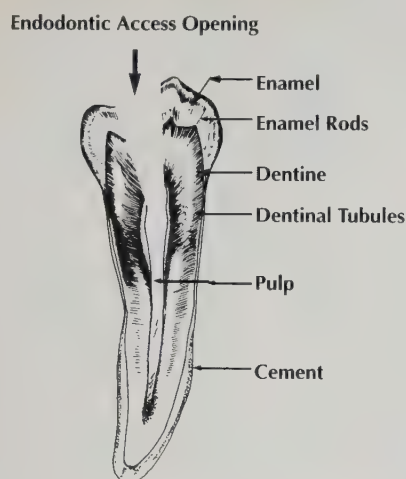


Fig. 1: Schematic representation of a longitudinal ground section of a mandibular bicuspid illustrating the composition and structure of the dentin-root complex.

different from the corresponding vital tooth. Obviously, the tooth will have an endodontic access opening and the vital pulp tissue will be missing, but perhaps less obviously, and more intriguing, are questions such as what potential characteristic changes will occur in the dentin-root complex, and how will these changes affect the restoration of that tooth? To put these questions into perspective, it may be helpful to review **Fig. 1** which represents a longitudinal ground section of a mandibular bicuspid and illustrates the composition and structure of the dentin-root complex. The figure shows remnants of the organic matrix of dentinal tubules.

Vital dentin basically represents calcified tissue with a calcified matrix characteristically having an organic component, an inorganic component, and a component of water.² What happens to this relationship once the pulpal tissues are missing and will a change in this relationship affect the characteristics of dentin? **Figure 1** illustrates a characteristic directional pattern to the dentinal tubules forming the organic matrix. These various patterns in different areas of the tooth, play a part in the physical characteristics of the dentin-root complex. Is the integrity of these various patterns affected by the endodontic procedures? Why, for example, do we

find root fractures that at times traverse horizontally, somewhat parallel to the dentinal tubules, or at times fracture vertically, perpendicular to the tubules, or at times fracture obliquely and follow no particular pattern in relationship to the dentinal tubules?

Various researchers have attempted to deal with these types of questions and there is scientific information supporting the contention that endodontically treated teeth are *different*. Some of this research has been reviewed by Dr. Gutmann³ and is itemized below:

1. The physical chemistry of dentin indicates that not only does radicular dentin possess less moisture content than coronal dentin, but that this moisture content can be calculated and will decrease as a result of endodontic procedures. This moisture loss appears irreversible even in a saturated atmosphere at body temperature, and the probability is high that this will result in an increased brittleness.⁴
2. Endodontically treated teeth will possess architectural changes affecting dentin characteristics such as strength and stiffness. The percentage of the effect depends on such technique facets as the nature of the access opening,⁵ the amount of radicular dentin removed during canal cleaning and shaping,⁶⁻⁸ and the nature of pending or existing restorative procedures.
3. The above architectural changes may change the

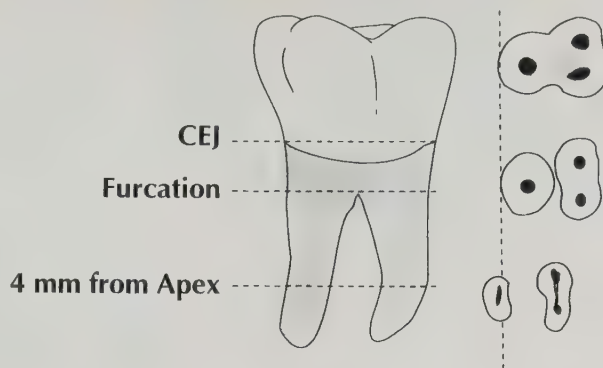


Fig. 2: Schematic cross-sectional representation of the three dimensional changes in root anatomy progressing from the C.E.J. to a point 4 mm from the root apex.

biomechanical behavior, affecting the ability of an endodontically treated tooth to deform under applied loads and increase the susceptibility to fracture.^{9,10}

4. Endodontically treated teeth appear to have significantly different physical and mechanical properties.¹¹ Significant properties of vital dentin are elastic modulus of approximately 1.90×10^6 psi, average tensile strength of 7.0×10^3 psi and compressive strength of 43.0 to 10^3 psi. These properties may be affected by a number of facets, but appear to be significantly lower in endodontically treated teeth. One explanation may be that intermolecular collagen cross-links are endodontically treated teeth are weaker. The collagen matrix forms the organic matrix of dentin and, in its mature form, contributes significantly to the above characteristics of dentin. Preliminary studies suggest that there are more immature collagen cross-links in endodontically treated teeth.¹²
5. Lastly, the loss of vital pulpal tissue will result in a significant decrease in the proprioceptive response from endodontically treated teeth and similarly an increase in the susceptibility to biomechanical forces.¹³ In fact, there is evidence to suggest that the pressure threshold, for example, is as much as 57 per cent higher in endodontically treated teeth as compared to vital teeth. In other words, the neurological reflexes that would normally operate to protect the structures

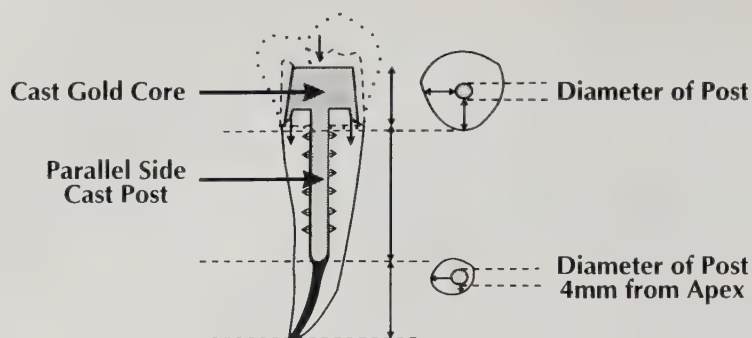


Fig. 3: Schematic representation of a cast gold post and core illustrating the relationship between the thickness of the radicular anatomy at the C.E.J. and at a point approximately 4 mm from the root apex.

from harmful occlusal and masticatory forces may be compromised.

Again, there is a perpetual debate throughout the research community related to the significance of each of the above items as they are individually offered as an explanation for the perceived difference.^{14,15} However, most authors find common ground with the basic premise that there is a difference in the collective dentin-root complex, as illustrated by the common clinical scenario of an increased rate of endodontically treated teeth.

Anatomical Risks Are Common During The Restoration Of Endodontically Treated Teeth

As indicated above, the status of the remaining structure of an endodontically treated tooth will impart an automatic implied risk. A second basic factor to consider that adds to this risk relates to tooth radicular anatomy and the ability of a specific root to accommodate a post and core design. Again, Dr. Gutmann³ provides a review that will provide a perspective risk that is tooth specific (**Table I**). The straight cylindrical root is the exception, rather than the rule. We must concern ourselves with anatomical facts such as:

2. generalized root taper and areas of rapid changes in taper,
3. proximal root invaginations and/or perforations,
4. root canal splitting,
5. root curvatures,
6. multiple canals, and
7. angle of crown to the root.

Globally, all of the above anatomical aspects must be considered in three-dimensions as post and core build-up navigates towards the apex of the tooth (**Fig. 2**). Notice from this figure the potential changes in the three-dimensional relationships of size, shape and position illustrated by the cross-sectional slices of a mandibular molar. The risk related to root anatomy for the restorative dentist is the predisposition to root thinning, perforations and root fractures. Root fractures may occur during post cementation, normal masticatory functional demands, parafunctional demands, and/or traumatic incidents. A basic guideline is a requirement of 1 mm thickness of dentin around the post as a margin of safety.¹⁶ This, of course, becomes particularly relevant in the apical third of the tooth as a parallel-sided post progresses from a comfortable thickness of tooth structure at the C.E.J. to a critical thickness — 4 mm from the apex (**Fig. 3**). A review of **Table I** would indicate that placing posts in maxillary premolars, buccal roots of maxillary molars, mandibular incisors and mandibular molars implies a high percentage of risk.¹⁷⁻²¹

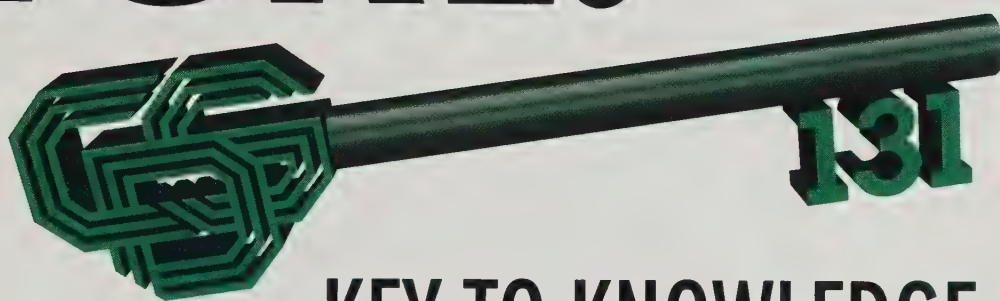


Fig. 4: Schematic representation emphasizing the importance of the remaining bulk of coronal dentin in terms of both width and height.

The Strength Of An Endodontically Treated Tooth Is Not Improved By Placing A Post And Core Build-up

A third factor that is supported by most of the above comments is the importance of preservation of tooth structure. A traditional concept that has recently been disputed²²⁻²⁸ is that a post improves the structural integrity of weakened endodontically treated teeth. Current research supports the contention that the strength of the remaining tooth is directly related to the remaining bulk of dentin and that fracture resistance diminishes with a decrease in dentin.²⁹⁻³³ Emphasis should be placed on the residual amount of coronal tooth structure above the margin of the tooth preparation and a distinction should be made between the height and width of remaining dentin, with more emphasis placed on the height (**Fig. 4**). Normally the application of many cylindrical post and core techniques requires additional removal of dentin with further weakening of the tooth. In 1984, Sorensen and Martinoff⁸ in 1984 found no significant difference in teeth restored with or without posts. Lovedahl and Nicholls,²² and Kantor and Pines,³⁴ found that endodontically treated un-reinforced teeth were twice as resistant to fracture as

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compared to post reinforced teeth or pin-retained cores. In addition, this research indicated that teeth without posts usually fracture in a repairable manner, while teeth with posts usually fracture at the roots, making repairs difficult or impossible.^{22,23} The overwhelmingly important factor of preservation of tooth structure implies that if there is sufficient sound coronal tooth structure remaining after caries control and endodontic procedures are completed, a post and core foundation will not improve the resistance to fracture.

Understanding The Goal Of A Post And Core Build-up

If we accept the above factors, then we must consider what we perceive as the goal of our build-up. A review of current research indicates that a build-up replaces missing tooth structure sufficient to provide adequate resistance and retention form for the final restoration.¹ Clearly, if there is sufficient remaining tooth structure, a post and core build-up will not be necessary and, in the interest of the patient, may be harmful. If a clinical decision still mandates the use of a foundation build-up, then it must be understood that there are two distinct components (**Fig. 3**), each with individual primary goals. The post of the build-up enters the radicular portion of the remaining tooth and has the primary function of retaining the core, not reinforcing a fragile root. Post designs, instrumentation techniques, cementation procedures etc., for the post must achieve adequate retention, preferably with a minimal increase in risk. The core portion of a build-up is an extension of the post external to the remaining tooth structure and has two functions: To augment the resistance and retention form of the final restoration, and to protect the remaining tooth structure and transfer forces in a strategic fashion to the root. The transfer of forces must be thought of in terms of core design, tooth preparation for the core, and core materials with the realization that the tensile strength of dentin is comparatively weak.³⁵

Again, the critical factor in resisting a fracture is the preservation of tooth structure and the thickness of the remaining dentin.

Understand The Association Between Risks and Morbidity of The Post and Core Unit

Once we have established the goals of the components of a post and core build-up, these components must act as a unit without promoting tooth breakdown. A fifth basic factor considers designs that initially present a minimal risk to the remaining tooth structure and offer a limited potential to retrieve the system and retreat the case. If, for example, factors related to a specific clinical case are such that a failure may occur, conceptually it is preferable to design a post that will come out rather than fracture the tooth.¹ If there is a possibility that stress concentrations will occur — either during insertion or function — as a result of a post and core design, and potentially result in a fracture, it is preferable to select a design that will either distribute the stress and/or strategically focus stress to the peripheral or external aspects of the remaining tooth structure. This would increase the probability that a potential fracture will involve tooth structure in the immediate proximity of the core, again leaving the option of retreating the case.

A similar risk and morbidity concept should be expressed in terms of the retrievability of the post. Many of the currently available design parameters are based predominantly on retention to the point of completely compromising any further conventional endodontics. A recent unpublished survey of Canadian endodontists indicated that a high percentage of their practice consisted of re-treatment cases that attempt to retrieve post and core build-ups. By electing to place a post and core build-up, the design emphasizing retention may mandate apical surgery. The surgery will produce significant damage to an already fragile root and will compromise any prosthetic restorations that rely on

that root for biomechanical support. It would seem logical, then, that the design of the system should provide for adequate retention but also a limited potential to retrieve the build-up.

Be Aware Of The Functional Environment

In addition, it is critical to be aware of the functional focus and stresses that may be transmitted to the build-up. This encompasses the whole gambit of treatment plan decisions that could directly or indirectly affect the functional environment of the build-up. One of the more important examples of the potential association of treatment plan objectives and the functional environment relates to the forces of occlusion.

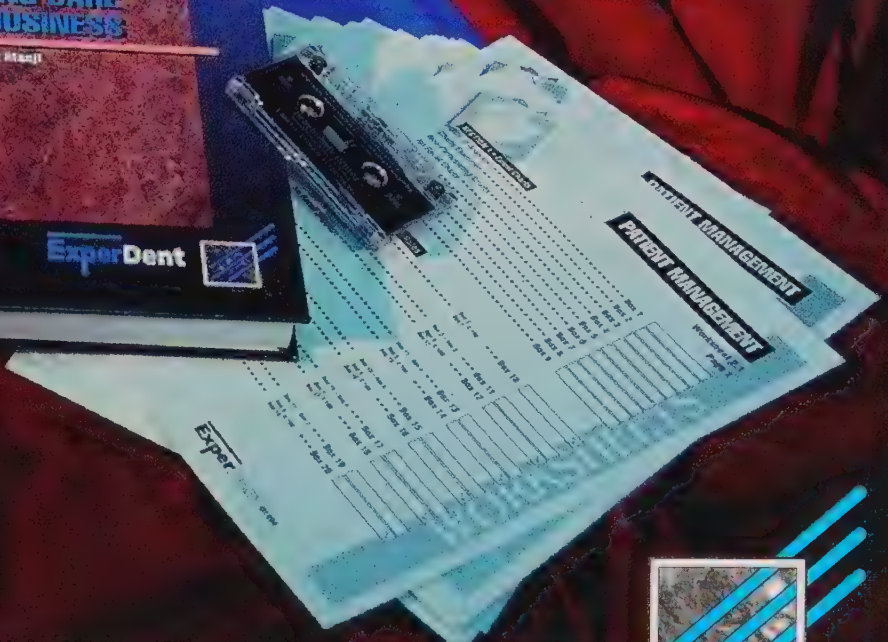
Occlusal force in the oral environment has been estimated numerous times throughout the research, with the maximum biting force often used as a standard of measurement. The maximum biting force has been estimated to vary from 55 to 280 lbs (average 162 lbs).³⁶ In the oral environment, this magnitude of force can be commuted into stress to the teeth (stress = force per area), and distributed throughout the entire dentition. There are a number of occlusal factors that will affect this normal biomechanical, force/stress relationship and result in a dramatic increase in the force and subsequent stress concentrations delivered to and transmitted through the build-up (**Fig. 3**). Treatment planning decisions and clinical techniques oriented around the distribution of the applied force can affect stress patterns. For example, unfavorable stress concentrations may be directed at the dentin-root complex of an endodontically treated tooth with the introduction of an occlusal interference. Consider that an average 162 lb force applied to one square inch produces a stress of 162 lbs per square inch. With the same maximum biting force, a single pinpoint occlusal interference could produce a dramatic local stress concentration increased by a factor of 10^2 to 10^3 per square inch.³⁷ Treatment planning decisions may favorably affect these



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stress patterns by directing stress down the long axis of the tooth in an effort to control the direction of the force. Unfavorable stress concentrations and patterns may occur when stress is directed in a horizontal or oblique fashion.

These same basic biomechanical concepts of direction and distribution will be affected by the dynamic nature of the forces of a dental occlusion through neuromuscular aspects such as the duration and frequency of occlusal contacts. Bruxers and clenchers, for example, have been shown to have higher maximum biting force and can sustain those forces for a longer duration and more frequently.³⁶ Temporomandibular joint dysfunction patients have been shown to have lower average maximum biting forces but these forces may be applied more frequently and with more sustained muscle contraction.³⁸ Treatment planning decisions throughout the course of treatment should be oriented around estimating and controlling both the biomechanical and neuromuscular aspects of this functional environment.

1. Initially through a pre-prosthetic occlusal stabilization phase which normally involves occlusal splint therapy and/or occlusal equilibration.
2. Then, continued through the pre-prosthetic work-up involving a diagnostic wax-up.
3. Further continued through both the temporization phase and the placement of the final prosthesis.
4. Maintained through both the temporization phase and the placement of the final prosthesis.
5. Maintained through the post-operative phase with frequent recall and potentially a post-operative occlusal guard.

There are a number of other potential examples — such as the stability and health of the remaining periodontium — that could be discussed further which illustrate the importance of functional environment. Clearly, however, treatment planning decisions that deal with these types of global issues

Table I
Anatomical Feature Limiting Post Installation

Tooth	Anatomical Feature
Max. Centrals/Laterals	Tapered Canals
Max./Mand. Canines	Wide Faciolingual, root invaginations
Max. Premolars	Thin, tapered, and curved roots vaginations and canal splitting
Max. Molars	Buccal roots — multiple risks
	Palatal root — facial curvature
Mand. Centrals/Laterals	Multiple risks
Mand. Premolars	Multiple canals, angle of crown to root
Mand. Molars	Roots narrow mesiodistally
	common invaginations and perforations

impart both a risk of compounding stresses delivered to an already compromised dentin-root complex and conversely provide the clinician with the opportunity to optimize and control the environment, forces and stresses delivered to the post/core unit.

Understand The Importance Of A Thorough Data Collection And Diagnosis As They Relate To Post And Core Build-ups

Our basic theoretical concepts, to this point, imply a potential risk and suggest the purpose of each component of a post and core build up. Dental practitioners should understand that although these concepts will affect the decision-making process in all cases, it is also necessary to focus on individual patient factors that affect the risk/benefit equation. These patient factors are routinely developed during thorough data collection and diagnostic procedures and it is important to emphasize that all diagnostic aids become vital. These include patient histories, extra- and intra-oral clinical examinations, radiographs, study cast analysis, diagnostic wax-up, etc. Patient factors thus established can be categorized under global issues affecting the entire denti-

tion, or under more specific issues affecting a particular tooth. Global issues noted during patient histories, for example, would be notations of chronic pain or sensitivity, especially if it occurs in the quadrant involving build-up such as a history of bruxism or muscle dysfunction. Global treatment-planning issues will become apparent from all diagnostic aids and practitioners are reminded that post and core build-ups are generally followed by definitive restoration. These restorations may involve multiple units of fixed prosthetics or a combination of fixed and removable prosthetics. These restorations will also have an effect on the functional environment, depending on patient data such as missing teeth, periodontal and osseous support, tooth positional problems, crown length, intra-alveolar clearance, etc. Clearly, a failure to address these sorts of global patient factors prior to initiating a post and core build-up can only lead to a higher incidence of failure.

Routine data collection will also identify specific issues, thus allowing the practitioner to concentrate on each tooth in question. Patient histories, for example, may indicate who performed the endodontic treatment on the particular tooth and what type of endodontic technique was used. There is some

indication in the research that, for example, the clinical application of some endodontic techniques may increase the incidence of root fractures.^{39,40} Specific concerns related to the tooth involved include the nature of existing restorations, and the amount of remaining coronal tooth structure. Routine periodontal work-up will provide an indication of periodontal factors to consider, such as the nature of osseous support for the post and core foundation. Specific periodontal factors related to the tooth involved include carious destruction of fractures invading the biological width. Gingival recession, lack of attached gingivae, furcation involvements, mobility problems, etc. will affect the risk/benefit equation for the particular tooth. Current, high-quality radiographs, as part of the data-gathering process, are an absolute necessity when the practitioner attempts to address specific issues. As such they should provide an indication of the following: the quality of existing endodontics, whether the endodontic treatment appears successful, whether there are obturation deficiencies, the nature of the fill material (gutta percha or silver points), the nature of the canal preparation and the size of instrument that was used. Radiographs should provide an indication of important specific questions on radicular anatomy, such as root taper, root curvatures, areas of furcation or fluting, supplemental roots, etc. (remember a straight-forward canal is the exception). As part of the radiographic data-gathering process it is essential to remember that routine periapical radiographs provide only two-dimensional cross-sectional anatomy from mesial to distal and from coronal to apical areas. For strategically important teeth, it may become necessary to take supplemental proximal or occlusal angulations to further assess root curvatures, facial-lingual invaginations, supplemental roots, etc. Radicular anatomy is clearly not predictable and the clinician must utilize all possible diagnostic data to establish the risk of challenging the anatomy of each specific tooth.

Conclusion

A predictable post and core build-up for endodontically treated teeth is based on an understanding of the above basic theoretical concepts. These concepts will help the dentist to estimate and establish the risk of placing a post and core build-up, and will dramatically improve an evaluation of the potential benefit. Part II of this paper discusses the clinical application of these basic concepts as a reference to evaluate traditional techniques, design characteristics and dental materials currently available for the restoration of endodontically treated teeth. ■

Dr. Manning is coordinator (head) of fixed prosthetics, University of Alberta.

Dr. D.C. Yu is clinical instructor, department of endodontics, Boston University, and clinical professor and head of endodontics, University of Alberta.

Dr. H.C. Yu is visiting faculty, department of endodontics, Boston University.

Dr. Kwan is a clinical instructor, department of endodontics, University of Alberta.

Reprint requests to: Dr. Kieth Manning, Faculty of Dentistry, University of Alberta, Edmonton, Alberta, T6G 2N8.

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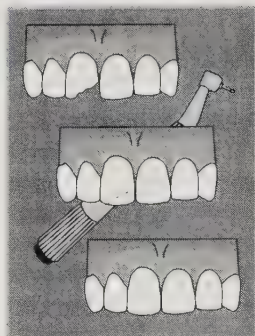
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RESTORATIVE DENTISTRY



Factors To Consider For Predictable Post And Core Build-ups Of Endodontically Treated Teeth Part II: Clinical Application Of Basic Concepts

K.E. Manning, B.Sc., DDS, MS

D.C. Yu, BS, DMD, M.Sc.D.

H.C. Yu, BS, DDS, M.Sc.D.

E.W. Kwan, BS, DDS

ABSTRACT

Post and core build-ups represent an important pre-prosthetic procedure prior to the restoration of an endodontically treated tooth. The dental practitioner is presented with the dilemma of selecting from an ever increasing variety of materials, techniques and designs related to this procedure, many of which are harmful and mired in controversy. Part II of this paper will review some basic theoretical concepts related to post and core build-ups with the objective of applying these concepts to address a number of pertinent clinical questions related to the above selection process. This review should provide the dentist with a reference to produce a more predictable post and core build-up.

SOMMAIRE

Avant la restauration d'une dent ayant fait l'objet d'un traitement d'endodontie, le montage des tenons et du noyau représente une importante procédure préprothétique. Le praticien dentaire est placé devant un dilemme et doit choisir parmi une variété de plus en plus grande de matériaux, de techniques et de con-

ceptions liés à la procédure, dont plusieurs sont dangereux et déni- grés par la controverse. Dans la seconde partie de cet article, on revoit certaines notions théoriques de base touchant le montage des tenons et du noyau en vue de les appliquer de manière à répondre à un certain nombre de questions cliniques pertinentes touchant le choix à faire mentionné ci-avant. Grâce à cette revue, le dentiste devrait avoir un point de repère pour monter les tenons et le noyau de manière plus prévisible.

Introduction

Post and core build-ups represent an important pre-prosthetic foundation procedure prior to the restoration of an endodontically treated tooth. Part I of this paper discusses a number of basic theoretical concepts to consider prior to restoring a tooth with a post and core build-up. This paper will review the application of these basic concepts in an attempt to address a number of pertinent clinical questions. Emphasis will be placed on an analysis of the multitude of traditional and new techniques, designs and dental materials currently available.

Does The Tooth Require A Post?

After a review of the patient data, our basic concepts suggest that if sufficient sound, coronal tooth structure remains, placing a post will not strengthen the tooth and it is advisable not to enter the radicular anatomy with a post. Firstly, the remaining coronal tooth structure is evaluated based initially on the extent of reduction required for the finished restoration; secondly, based on the thickness of the remaining dentinal wall above the margins of the tooth preparation, with emphasis on adequate thickness for rigidity and strength (about 1 mm minimum); and, thirdly, based on an evaluation of the width and depth of the pulp chamber. Once the value of the remaining coronal tooth structure has been established, an acceptable build-up technique to augment that tooth structure has been advocated by Nayyar¹ and consists of condensing a material such as amalgam into the coronal pulp chamber. This technique has been supported by a number of other authors and certainly involves a minimum amount of risk.² Research also indicates that pro-

Table I**Width of Common Threaded vs Non-threaded Post Systems (Based on the smallest size)**

Post	Vendor	Diameter (mm)	Classification
Para Post	Whaledent	0.9	Non-threaded
Unity Post	Whaledent	0.9	Non-threaded
Vlock Passive	Brassler	1.2	Non-threaded
BCH Post	3M Dental	0.8	Non-threaded
BKS Post	Brassler	1.4	Threaded
Vlock Active	Brassler	1.3	Threaded
Kurer Fin Lock	Teledyn Getz	1.7	Threaded
Flexi-Post	Essential Dental	1.0	Threaded
Radix Anchor	L.D. Caulk	1.2	Threaded

vided there is 4 mm or more of pulp chamber height, there is no need to extend amalgam into the root canal space, and in that sense fulfil a requirement of retrievability (Fig. 1). This technique may be further enhanced by the use of a number of amalgam adhesive bonding agents.^{3,4}

What Is The Best Technique For Radicular Preparation?

If the decision requires that a post be used as part of the build-up, the technique indicated is one that will remove gutta-percha and at the same time minimize risk. Chemical, thermal and mechanical methods have been advocated,⁵ and results of these research articles indicate that thermal heated pluggers are the safest. Concern was expressed over the potential increased leakage resulting from the use of chemicals⁶ because the evaporation of solvents from these chemicals may cause a dimensional change in the gutta-percha. Mechanical techniques are more common, principally because they are faster than thermal techniques. It should be noted, however, that the mechanical techniques disturbed the apical seal to a greater degree. Side cutting instruments such as Gates-Glidden serial drills and Pessio Reamers are the safest mechanical means⁷ (Fig. 2). Canal preparations that use end-cutting burs dramatically increase the risk

of root perforation or root stripping. Many of the post designs are matched to the mechanical drill systems. For example, a yellow Para-post matches a no. 4 Gates-Glidden, or a no. 3 Pessio Reamer. This allows for passive insertion of the post into a matched channel, combining minimal risk and optimum retention.⁸ Canal preparations that require the use of "tapping" drills, such as the threaded design post systems, require the removal of additional tooth structure and generally result in a wider post preparation (Table I). Both of these aspects may impart an unacceptable risk for the particular clinical case in question. The actual timing of the removal of the gutta-percha does not appear to be significant in terms of risks, with some research indicating immediate post obturation to be the best,⁹ while other authors support a delayed removal to allow time for the sealer to harden.¹⁰ The speed of rotation of mechanical drills was significant, with the optimum speed equalling the maximum speed of slow-speed handpieces.⁵

What Is The Best Technique For The Preparation Of The Remaining Coronal Portion Of The Tooth To Receive The Core?

Initial efforts at preparing the remaining coronal tooth structure will be dictated by both caries control and the reduction parameters of the final fixed prosthetic res-

toration. From that point, the core preparation is clearly dominated by the basic concept of preservation and enhancement of the remaining tooth structure — preservation of tooth structure in the sense that the core preparation should be kept as conservative as possible with efforts made to remove only unsupported tooth structure that may inadvertently fracture prior to final placement of the build-up. Coronal tooth structure can and should be enhanced with multi-disciplinary procedures, such as periodontal crown lengthening or orthodontic forced eruption (Figs. 3a, 3b, and 3c). Clinical data and individual case selection become critical in these multi-disciplinary decisions. Once the remaining coronal tooth structure has been established, refinements to the core preparation can be further undertaken according to the perceived function of the core. Emphasis should be placed on protecting the remaining tooth structure and attempting to transfer forces in a strategic fashion down the long axis of the root (Figs. 4, and 5); in an attempt to minimize stress concentrations, particularly in the internal aspect of the remaining cervical root structure,^{8,11} and to provide vertical stops to resist compressive functional forces. These vertical stops should be preferentially prepared as far from the internal aspects of the root as possible. Strategic anti-rotation preparations for the core — such

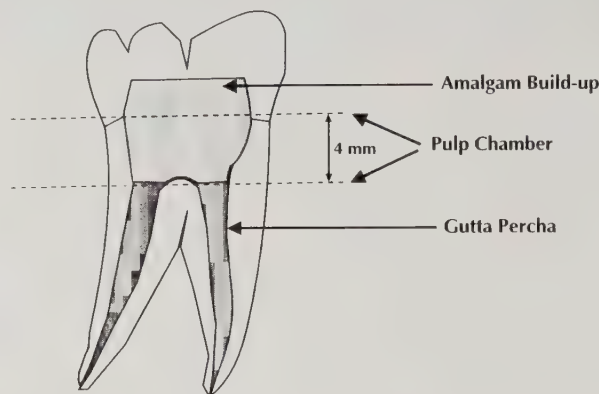


Fig. 1: Schematic representation of a coronal-radicular amalgam build-up emphasizing the relationship between the height of the pulp chamber and the relative necessity of entering the root canal anatomy with amalgam.

as grooves, parallel walls and/or ferrule preparations — are recommended to resist tortional forces, but should be kept conservative. The main advantage of a ferrule is to aid in the transfer of tensile and shear stresses to the coronal tooth structure with minimal risk for an irreparable root fracture^{12,13} (retrievability). Pin placement as an anti-rotation device dramatically increases the risk of a fracture.¹⁴

When Is A Direct Or An Indirect Technique Preferable?

Direct build-up techniques routinely involve the use of core material — such as amalgam, composite or glass ionomer — placed in the pulp chamber, and commonly involve the use of pre-fabricated posts into a radicular preparation. There are other specific dental material factors to consider later in this paper but the primary considerations related to the use of a direct technique are economics and time. Based on a concept of retrievability, it is preferable to place a post in an accompanying radicular preparation rather than the core material itself. Considering data collection and treatment planning, direct techniques are acceptable principally for posterior teeth when:

1. there is adequate remaining coronal tooth structure,
2. adequate bulk of restorative material can be achieved,
3. primary occlusal stresses are of a compressive nature and can

be directed down the long axis of the root, and

4. specifically, there is a desire to enter multiple canals with post preparations. Direct techniques are less acceptable for anterior teeth, which inherently require smaller amounts of restorative materials and are subject to more tensile and shear stresses.

Indirect techniques require an impression and model during the preparatory stages to produce a cast metal post and core build-up. The additional clinical and laboratory procedures involved with this technique may be more difficult and time-consuming, however, this technique provides the opportunity to control and optimize most of the design characteristics of a post and core build-up. The actual physical design of the build-up can be conveniently modified and manipulated with design characteristics, such as increasing the number of posts, strategically positioning vertical stops during the core preparation, or strategically including anti-rotation provisions both internally and externally. The shape of the core can be controlled to optimize R & R form, optimize axial contours and occlusal clearance, etc. Most of the above characteristics can be incorporated while maintaining sensitivity to the risks, goals, functional requirements and retrievability of the post and core. A passive fit of the casting can be ensured by the selective use of die spacers on the master die prior to the wax-up and

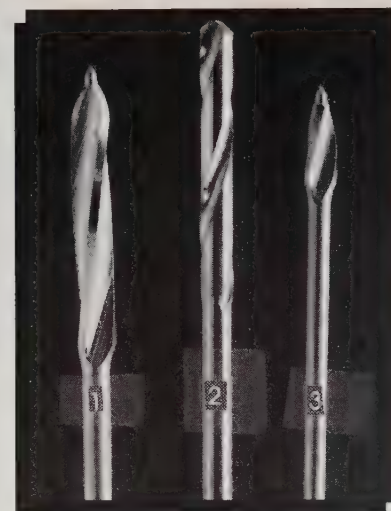


Fig. 2: An enhanced photograph illustrating commonly used mechanical drills used for radicular post space preparation from the observers left to right:

1. Gates-Glidden Drill
2. Para Post Drill
3. Pessio Reamer

by the relative control over the expansion and contraction characteristics of the dental casting investment (**Figs. 6a**, and **6b**).

Combination direct/indirect techniques involve preparing a build-up pattern intra-orally with the specific objective of investing and casting the pattern. These techniques have many advantages:

1. They are universally applicable.
2. The criteria for the pattern design characteristics are under the direct control of the dentist. And,
3. the dental material aspects can be specified by the dentist.

Currently, these techniques employ a plastic burn-out post which is matched to a drilled, parallel-sided radicular preparation, and this is combined with a core portion applied segmentally with a resin material such as Duralay — the material is applied segmentally to minimize the shrinkage characteristics of the resin. This technique can be applied with the same sensitivity as an indirect technique but it is important to clinically ensure that the casting does not bind on insertion and sits passively with appropriate vertical stops.



Fig. 3a: Clinical photograph illustrating endodontically treated teeth requiring crown lengthening procedures to augment the remaining amount of coronal tooth structure.

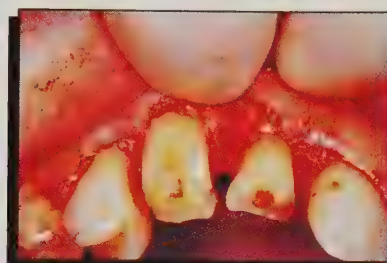


Fig. 3b: Clinical photograph illustrating crown lengthening surgical procedures used to augment the remaining coronal tooth structure.

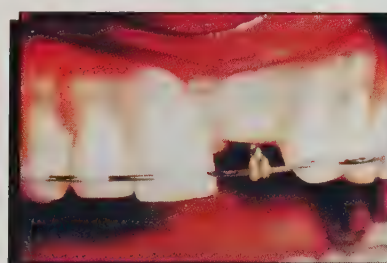


Fig. 3c: Photograph illustrating an orthodontic forced eruption technique designed to enhance the height of the remaining coronal tooth structure prior to proceeding with a build-up.

What Are The Optimum Characteristics Of The Post Design?

Currently, there are 75 to 80 different indirect post designs on the market, making the selection of a system for your office a difficult task. In order to simplify the process, it is helpful to consider design parameters such as post length, width and surface characteristics separately.

Post Length

The decision related to post length presents a paradox in the sense that an increase in length will increase the risk, but, on the other hand, it will also allow for more even stress distribution and has a direct effect on increased retention.^{8,11} Researchers have attempted to answer the dilemma by advocating the following common guidelines: preservation of a minimum of 3 to 5 mm of remaining gutta-percha,¹⁵ acceptable length of the post equal to the anatomic crown¹⁶ or equal to one-half to two-thirds of the length of the remaining root,¹⁷ and/or half the length of the root contained within bone.¹⁸

These guidelines are worth considering, but the dilemma still exists and the reality is that a decision related to post length is best made with the realization that each clinical case is unique. Patient data collection and subsequent case selection may be the most important considerations.

Using that rationale, it would seem logical to select a post system that can be easily modified and universally applied. For example, the Para Post or Unity Post (Whaledent) or the Vario Post (Brassler). The Kurer Fin Lock Post (Teledyne Getz) or the Radix Anchor (L.D. Caulk),

are difficult to apply universally without the removal of substantially more tooth structure in order to seat the system. Post systems requiring radiographic templates sound impressive, but, in fact, tend to indicate the restrictive nature of the post design, for example the Flexi-Post (Essential Dental Systems) or Cytco Posts (L.D. Caulk).

Post Width

Research is perhaps much more clear with respect to post width. Most authors indicate that an increase in the width of the post has very little effect on the retention of the post and dramatically increases the risk.^{8,19} Again, preservation of tooth structure is of prime importance. There is little indication for increasing the post width beyond the endodontic cleaning and shaping procedures. **Table 1** provides an interesting comparison of the width of various common parallel-sided post systems (threaded versus non-threaded), using the smallest post as a base line. It can be noted from this table that a corresponding threaded post system, based solely on width, will probably require the removal of more tooth structure. It is also important to recognize the relevance of these measurements in relation to the remaining tooth structure, especially at the apical end of the post. It has been suggested that there should be at least 1 mm between the wall of the prepared canal and the outer surface of the root (**Fig. 4**).²⁰

Post Surface Characteristics

This is a hotly contested issue in the research. Surface charac-

teristics can be categorized as follows:

1. Designs that duplicate the canal anatomy, with the classic example being the traditional custom, cast, cemented post.
2. Designs that alter or modify the canal anatomy to accommodate either a prefabricated tapered or parallel shaped post. And,
3. surface characteristics oriented around either active or passive retention.

Again, the clinical application and selection of these different systems must be considered in relation to the risk/benefits equation. In other words, what is the ability of these design characteristics to provide adequate retention and stress distribution with minimal risk of a root fracture, perforation, etc. As a general statement, it appears possible to achieve adequate retention with any of the basic techniques. But it also appears that designs that attempt to increase retention can create inordinate increases in stress concentration regardless of the nature of the loading stress. The decisive factor, therefore, will be the design of the system, based on the location and intensity of stress concentrations and the realization that stress concentrations will occur during both installation and function.²¹

Posts designed to reproduce the internal radicular canal anatomy — such as the traditional custom cast posts — carry a relatively high risk factor of a wedging effect and subsequent root fractures⁸ and, interestingly, are the least retentive and, in essence, least beneficial.

Relax!

As a kid, when I went to the dentist, every "buzz" and "clink" and "grind" made me anxious. But once my dentist explained what the instruments did, I could sit back and relax, knowing everything would be OK.

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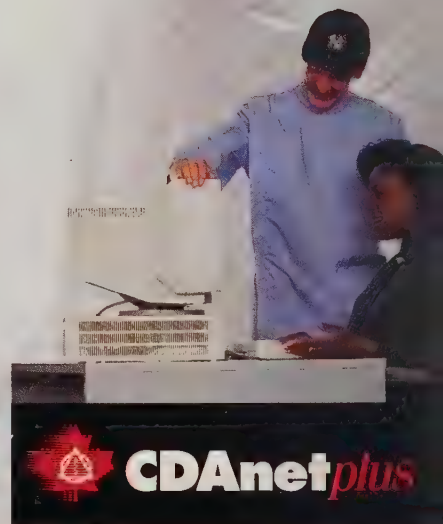
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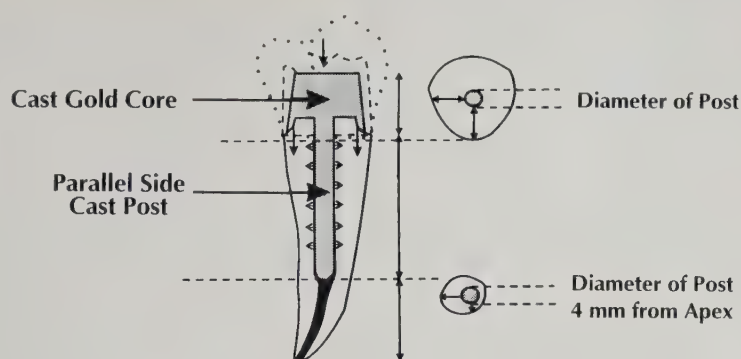


Fig. 4: Schematic illustration of a cast post and core design. The emphasis is placed on the core portion of the build-up and design characteristics to envelope and protect the remaining coronal tooth structure and transfer functional forces down long axis of the root.

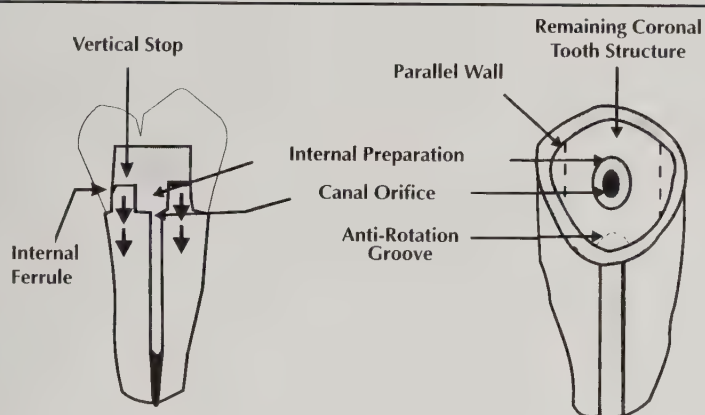


Fig. 5: Schematic illustration emphasizing the core preparation of a build-up and techniques that may be used to transfer forces to the remaining tooth structure in a strategic fashion.

Category 2, i.e. tapered post designs, present the same significant risks associated with a wedging effect and stress concentrations. This can only increase as the design moves from a tapered smooth, passively inserted post (e.g. the ER Post, Brassler), to a tapered, serrated post (e.g. Luminex Post, Weissman Dental), to a tapered, active, threaded post (e.g. Dentatus Classic Post, Weissman Dental). Parallel post systems appear to distribute stresses more evenly than other systems, and potential stress concentrations can be minimized⁸ by basing retention characteristics on surface serrations and passive insertion rather than on active threads (Para Post, Unity Post, Vlock Passive Post). This appears true during installation and function and also results in a lower frequency of fracture and, generally, if a fracture occurs, it involves less tooth structure.²² The greatest con-

centration of stress associated with these systems is a compressive stress in the area of the apex.²³ These compressive stresses can be controlled by the core, provided occlusal forces do not impact directly on the post head.

Category 3 designs, i.e. active threaded systems, have recently generated a high level of interest — both clinically and in the research. This appears to be related to a dilemma in the risk/benefit equation. Threaded post systems, for example, are clearly the most retentive systems,⁸ but it is just as clear that we will pay a price for that retention with an increase in all parameters of risk. Threaded systems generally tend to impart an increased risk related to the necessity of increased removal of tooth structure with a comparative increase in width (Table I). If the threaded systems fail, the failure is invariably irreversible.²⁴ The post

threads and the increased retention would certainly present a concern related to our ability to retrieve or back the post out of the canal without further fracturing the tooth. Considerable discussion exists in the research related to the threaded post design and stress distribution. Many authors support the contention that threaded posts focus stress as each thread contacts the tooth.^{11,25,26} This focus of stress occurs on insertion of the post and increases during function. In all probability these stress concentrations will have large tensile and shear components to which the dentin-root complex is particularly sensitive. Other authors suggest that there are positive aspects to stress distribution with threaded systems but this appears to be related only to the distribution of compressive stresses.²⁶

There are numerous variations on this threaded theme with each manufacturer claiming the attributes of his or her system. Interestingly, many of the modifications to the theme attempt to minimize and control stress concentrations. Some systems thread the post directly into the radicular anatomy, for example Kurer Standard Anchor (Teledyne Getz). This practice, in the purest sense, can be referred to as active retention and has a high risk with an increased potential of inducing stress fractures. Many of the newer threaded systems prefer to tap or thread the internal radicular anatomy with a tapping drill and insert a threaded post matching the threads. For example, the BKS Post (Brassler), the Kurer Fin Lock (Teledyne Getz) or the Dentatus Classic Post (Weissman Dental). Threaded posts have been further modified into systems with "cutting" threads — Radix Anchor (L.D. Caulk) for example — and those with "spreading" rounded threads — Dentatus Classic Post for example. Again, each system implies different stress patterns.²⁶ An interesting variation that attempts to deal with the potential stress induction is a design providing for stress release with a relief slit in the centre of the post (Flexi-Post from Essential Dental Systems). Caputo¹³ attributes the collapse of this stress release de-

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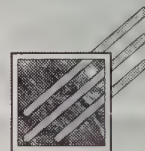
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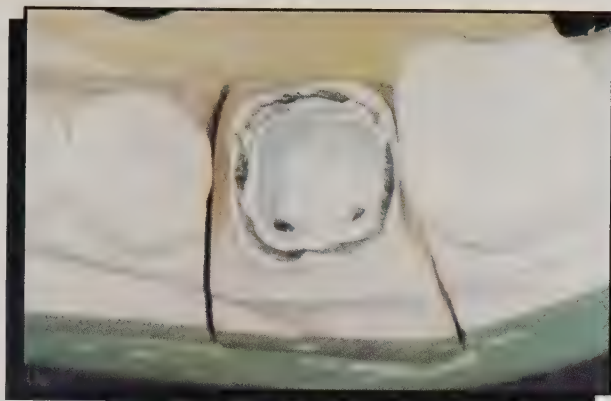


Fig. 6a: A photograph illustrating the selective use of die space on the internal aspects of a master die prior to the wax-up of a cast gold post and core.

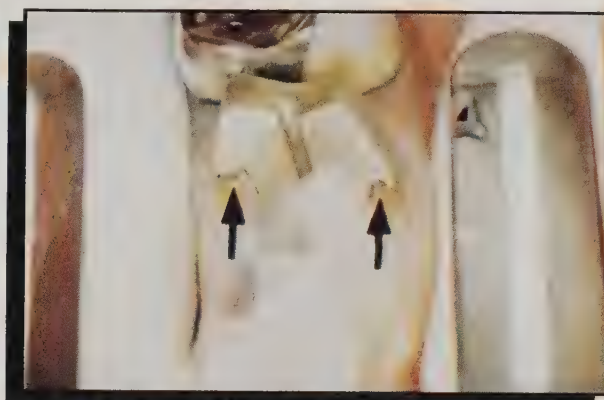


Fig. 6b: A photograph illustrating a section of a two-piece cast gold post and core build-up. Note the space insuring a passive fit on the internal aspect of the core and a positive core-to-tooth contact at the periphery of the core.

sign to its elliptical shape, which would inherently increase stress as it is threaded into place. It should be noted that other authors have questioned the merit of this design and make it clear that stresses develop during the insertion of this post.^{21,26} Modifications to the threaded post theme continue ad nauseam, from deep to shallow threads, from threads closely spaced to those with wide spaces, etc. and eventually the dental profession must question the rationale for the tremendous number of variations on the same theme.

In the final analysis, the optimal post design must collate the above design parameters (length, width, surface characteristics). Conceptually, the selection should be based on a design that can be inserted and function adequately with a minimal amount of increased risk to the patient. As mentioned previously, the primary function of the post is to retain the core with a minor role attributed to stress distribution. A review of the above design parameters suggests that a parallel-sided, serrated post passively inserted into a matching channel, with the capability of being easily modified in terms of length, may be the best universal choice. Risks can be further reduced by minimizing the width of the post without a significant effect on functional parameters. In general, many of the techniques and designs pay far too much attention to maximizing retention²⁷ in excess of a normal functional environment. This emphasis on retention increases the risk and, if the environment is hostile,

will not prevent a failure. Often this failure will be irreversible or the post and core system will be non-retrievable.

What Is The Best Agent Or Technique For Cementation?

Firstly, it is important to realize that cementation of the post and core build-up serves two functions: retention, and stress distribution. The latter is perhaps the more important in relation to a risk/benefits equation because the potential exists for functional stress to be transmitted from the post to the dentin through the cement layer. The potential also exists for the cement to serve as a buffer to forces, thus allowing better stress distribution.^{21,28,29} Historically, a number of research articles have indicated that the cementing agent itself may not be the critical factor in retention and stress distribution qualities.⁸ It appears that the technique for cementation may be more important than the agent itself, and, in that sense, a number of technique recommendations are worth considering.

Emphasis should be placed on controlled placement of the cement in order to achieve uniform application to the radicular anatomy and post³⁰ — the best instrument for this placement seems to be spiral lentulo. The cementing agent should be placed in a thoroughly dry canal. It is not necessary to apply the cementing agent directly to the post prior to insertion.³¹ Once the cementing agent is mixed and

placed in the tooth, it is important that the build-up is inserted immediately to optimize the flow characteristics of the cement. In addition, the post design should provide for a cement vent channel, and care must be taken to allow for the dissipation of hydraulic pressure in order to minimize the relative deformation of the remaining root, thus minimizing the risk of a root fracture during cementation.³²

More recently some authors have advocated the use of low viscosity resin cements, with perhaps the best example being All-Bond 2 (Bisco).³³ These cements have been proven to increase retention by bonding directly to the radicular dentin. Technological improvement in resin cements can now provide not only a bond to radicular dentin, but also bonding directly to the post itself.³⁴ Advocates of this technique suggest that this bonding allows for the use of more conservative post preparations, minimizes the risks and enhances the distribution of functional stresses.^{35,36} Major concerns related to resin cements are:

1. On retrievability, the emphasis is on retention to the point that it may not be possible to remove a build-up cemented with a resin cement.
2. Thermocycling and microleakage still remain³⁷ as prominent concerns, especially related to the potential volumetric expansion of the resin cement.

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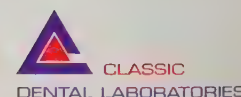


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Considering a risk/benefits equation for resin cements, it is appropriate to reserve their use for teeth with a guarded prognosis and/or in situations where the radicular dentin is already very thin and inherently weak. Additional caution should be expressed with respect to resin cementing agents that rely on an anaerobic environment for polymerization — Panavia (Kuraray Co.) for example. It is not uncommon for these agents to polymerize prematurely at the apex of the canal, consequently preventing placement of the post, and it becomes virtually impossible to remove the cement once this unfortunate event has occurred.

What Are The Best Dental Materials To Use For A Post And Core?

A variety of dental materials have been developed for application to both the post and the core. Again, the selection of these materials becomes confusing unless we consider our basic theoretical concepts.

Dental Materials and The Post

The materials currently available are:

1. prefabricated stainless steel,
2. prefabricated titanium,
3. cast alloys generated from a prefabricated plastic pattern,
4. prefabricated glass ceramic post,
5. prefabricated high performance carbon fibre post, and
6. custom post produced intra-orally by amalgam or composite.

Most of these dental materials can be eliminated quickly — except in special circumstances — by virtue of retrievability. For example, it is very difficult to retrieve the materials in groups 2, 4, and 6. The physical characteristics of these post materials, such as strength and modulus of elasticity (rigidity), is important with respect to risks and preservation of tooth structure.^{8,13} In other words, the width of the post should be minimized, but sufficient to resist functional forces. Most of the above systems require an increase in width to compare favorably in terms of physical characteristics.

Materials with a high modulus of elasticity, i.e. rigid materials, appear more resistant to distortion and distribute loads more evenly. The prefabricated steel post and cast metal (Class IV alloys) posts (Figs. 4, and 5) can maintain the necessary physical characteristics within the narrow parameter of most endodontic cleaning and shaping procedures and are, in this sense, excellent choices. Some concern has been expressed in the research with relation to the potential for corrosion. These concerns have been expressed in terms of biocompatibility and implications of the potential for volumetric expansion within the radicular anatomy.^{38,39} The potential for corrosion will be affected by the harmony between the material used for the post, the core and the finished crown. This harmony requires a degree of flexibility which is best achieved by cast metal. Again, this flexibility makes cast metal a more universal choice and provides for limited control over the physical characteristics. An excellent example is Jelenko's Maestro Class IV alloy, which has the additional benefit of a relatively low cost and excellent castability to a thin diameter.

Dental Materials and The Core

Commonly used materials fall in to the following categories:

1. cast metal alloys,
2. amalgam,
3. composite resin, and
4. glass ionomer mixtures.

The basic concept that may be of most assistance in the selection of a core material relates to function, with a major emphasis on the ability to strategically transmit functional forces. The material should be capable of performing this task over an extended period of time, and in a variety of clinical circumstances and treatment goals. Some of the dental material characteristics to consider would be:

1. compressive strength,
2. tensile strength,
3. yield strength,
4. hardness,

5. stability, and
6. and modulus of elasticity.

Most of the forces that a build-up will experience can be categorized into compressive forces, and horizontal tensile or shear stresses. In clinical situations where most of the forces can be limited to compressive forces, all of the materials do relatively well, provided sufficient bulk of material can be achieved. The introduction of tensile forces can create problems for most of the materials. These forces often result from teeth with occlusal interferences, teeth serving as strategically important bridge abutments, or a patient's history of bruxism and clenching. They may also result from a normal functional relationship in the anterior quadrants or in teeth with a minimal amount of remaining coronal tooth structure. These stresses could also be related to the union of the post head and the core material. A variety of different post head designs have recently been marketed with the objective of retaining the core material. Very little appears in the research on this subject and the rationale for an advantage of one "unique" design over another is, at best, confusing. An obvious concern is that the post head will change the physical characteristics of the core material itself and, most probably, to the detriment of the material.^{40,41} Tensile functional forces, for example, expressed on the post and core system may result in increased flexibility of the core material or a separation of the post and core. This may result in functional forces transmitted directly to the post with an associated increase in risk to the remaining root.

The use of the above core materials and their response to functional demands is discussed by a number of authors.^{2,40-46} Again, the core material that provides the most predictable results and optimal physical characteristics is a Class IV metal alloy. Casting the post and core as one unit minimizes the possibility of separation. These alloys possess a coefficient of thermal expansion similar to that of natural tooth structure, and are versatile enough to be used in almost all clinical situations —



they can be modified to improve characteristics and design factors according to clinical requirements (Figs. 5, 6a and 6b).

A second choice would be amalgam as a core material. With sufficient bulk, amalgam has adequate clinical characteristics. Some concerns commonly expressed with amalgam relate to its tensile strength, the potential for the amalgam core to separate from the head of the post, and the potential increase in corrosion products resulting from contact between amalgam and the alloy of the crown.

Composite resin can be used efficiently and has good strength characteristics. Concern has been expressed with relation to their relatively low modulus of elasticity (flexibility) in comparison to both the post material and the remaining tooth structure. The difference in flexibility in response to the functional environment and cyclic fatigue loading of the materials may result in an increased risk of fracturing of either the post or the tooth.^{45,46} Concern continues to be expressed about potential microleakage, water absorption, and dimensional stability of composite materials. Significant advancements have improved bonding characteristics and decreased the problem of polymerization contraction, but the thermocycling problem remains. The coefficient of thermal expansion of composite resins is two to three times greater than tooth structure. Therefore, temperature changes over the long term ultimately increase microleakage. Glass ionomers, de-

spite attempts at various combination mixtures, are still of major concern, particularly in relation to tensile strength. This is of concern when considering that tensile stresses often result in microfractures at the core tooth interface or at the core and head interface.

Conclusion

The selection of both post and core dental materials and techniques is becoming an ever-increasing problem. There is a tremendous variety in the marketplace and the number appears to be increasing. The objective of this paper is to review some basic theoretical concepts related to the selection process. This review should provide the dentist with a reference to produce a more predictable post and core build-up. Emphasis is placed on establishing a risk factor and creating design criteria to minimize the risk in harmony with a predictable result. ■

Dr. Manning is coordinator (head) of fixed prosthetics, University of Alberta.

Dr. D.C. Yu is clinical instructor, department of endodontics, Boston University, and clinical professor and head of endodontics, University of Alberta.

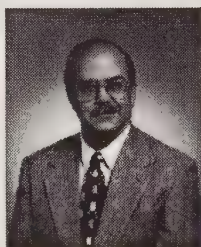
Dr. H.C. Yu is visiting faculty, department of endodontics, Boston University.

Dr. Kwan is a clinical instructor, department of endodontics, University of Alberta.

Reprint requests to: Dr. Kieth Manning, Faculty of Dentistry, University of Alberta, Edmonton, Alberta, T6G 2N8.

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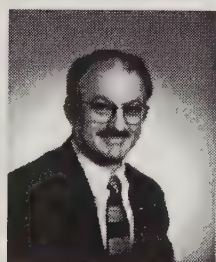
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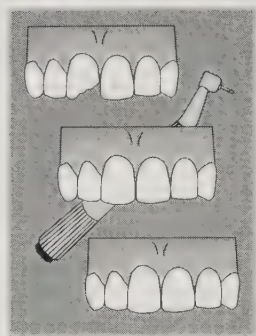
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RESTORATIVE DENTISTRY



Reducing Marginal Flash In the Fabrication of Direct Provisional Restorations: A New Technique Using Light-Cured Resin and Transparent Silicone

W.H. Liebenberg, B.Sc. BDS

ABSTRACT

The optimum placement of bonded indirect restorations depends to a large extent on establishing and maintaining the patient's gingival health during the provisional treatment phase, as inflamed sulcular tissues may compromise subsequent isolation efforts. Gingival health is best achieved by providing provisional restorations of correct emergence profile and accurate margination. This paper introduces a fully-cured direct provisionalization technique that minimizes marginal flash and improves the accuracy of the restoration in a fraction of the production time needed for traditional direct techniques requiring remargination. The technique, which relies on the use of a unique transparent over-impression registration material and visible light-curing provisional composite resin, is described in a case report.

SOMMAIRE

Pour réussir au mieux dans la mise en place des restaurations indirectes liées, tout dépend dans une large mesure du rétablissement et du maintien de la santé des gencives du patient durant la phase de temporisation. En effet, si les tissus du sillon gingival sont enflammés, ils risquent de compromettre les tentatives d'isolement par la suite. Le mieux pour garder les gencives en santé, c'est de faire des restaurations provisoires présentant un bon profil d'émergence et une margination précise. Dans cet article, on présente une méthode directe de fabrication de restauration provisoire

qui minimise les excès gingivaux et rend la restauration plus précise en moins de temps qu'il n'en faut ordinairement avec les techniques directes traditionnelles exigeant une redéfinition des bords. À l'aide d'un cas, on explique cette technique qui fait appel à un matériau d'empreinte en surimpression transparent de conception originale et à une résine composite provisoire polymérisable à la lumière visible.

Introduction

The restorative ethic encompasses both mechanical and biological components. Esthetic restorative materials must optimally restore both the morphology and the original mechanical resistance of the tooth so that it may resume proper function. Aside from compatibility concerns, these materials must ensure external and internal adaptation, allowing the restoration to be sealed to prevent recurrent caries, pulpal injury, and dentinal sensitivity.¹

Although these challenging requisites can now be met with ceramics, the quest for esthetic realism and satisfactory clinical longevity in the restoration of posterior teeth was, until recently, tempered by the absence of a high-performance luting material. The introduction of improved new-generation products has greatly reduced the shortcomings of inadequate adhesion. Neverthe-

less, polymerization shrinkage continues to reign as the Achilles heel of all composite resin luting materials, and the inherent disadvantage of employing composite resin as a luting medium and a substrate of cervical dentin remains problematic when restoring deep interproximal lesions.

The marginal adaptation of posterior ceramic restorations relies on adhesion excellence which, in turn, relies on an optimum restorative environment at the cementation appointment. This is easily achieved when the restorative margins are confined to the coronal portion of the clinical crown, however, newly improved dentin bonding values have greatly expanded the applicability of bonded ceramic restorations. As a result, restorative margins increasingly approximate the sulcular tissues and isolation perfection is proportionately more elusive. The optimum placement of bonded indirect restorations relies on the maintenance of gingival health during the provisional treatment phase to ensure that isolation efforts are not compromised by inflamed sulcular tissues.

Quick temporaries fabricated with flexible VLC provisional materials — such as E-Z Temp (Cosmedent, Chicago, Ill.), Fermite-N (Ivoclar North America Inc., Amherst, N.Y.), Intertemp (E&D Den-

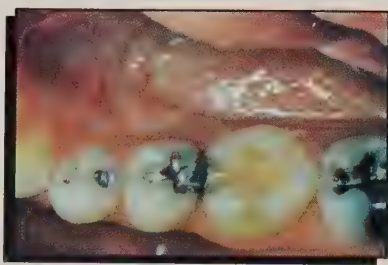


Fig. 1: Preoperative occlusal view of mandibular sextant displaying marginal breakdown and the concave incongruous restoration of the mesial surface of the first molar. The patient requested esthetic tooth-colored restorations.

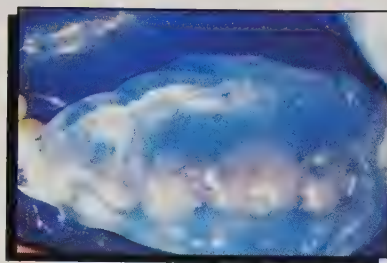


Fig. 2: The quadrant is isolated using rubber plunger assisted primary retention of the dam. This alternative retention permits approximation of the opposing arch during the transparent polyvinyl siloxane over-impression.

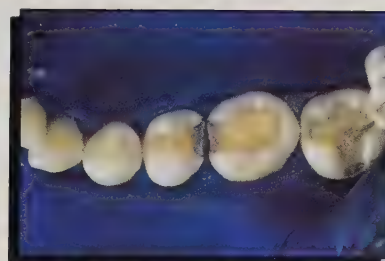


Fig. 3: The indexed over-impression transparent registration is removed and placed aside. The existing restorations are removed, direct resin restorations are placed on the first premolar, and the buccal restoration of the first molar is resurfaced. The indirect cavity preparations are completed in the usual manner, paying particular attention to the obligatory rounded outline form, which is without undercut. Note the conservation of tooth structure and the concave interproximal cervical outline, which is responsible for the encumbrance of achieving optimal marginal ridge morphology with the direct restorative options.

tal Products Inc., Somerset, N.J.), Tempo-Rex (Sci Pharm) and Triad VLC — are acceptable in Class I cases and in those Class II situations where there are buccal and/or lingual extensions without approximal contact involvement. These materials are decidedly inappropriate when restoring contiguous Class II restorations because they do not allow for mandatory flossing during the provisional period. Another contraindication is their flexibility, which permits embrasure expansion.

The light-cured acrylic technique described below is offered as the standard method for improving the marginal interproximal fit of direct temporary acrylic resin restorations.

Discussion

Importance of Provisionalisation

Each element of fixed prosthetic dentistry involves possible and probable insult to the pulpal tissues of the tooth. Temporary coverage of a prepared tooth during the various stages of treatment is an important step in the construction of a fixed dental prosthesis. The abundance of literature on the fabrication of provisional restorations reflects the importance of this phase of fixed prosthodontics, in as much as it represents an important prelude to the final restoration. Nevertheless, the procedures of tooth preparation, gingival displacement, and impression-making invariably receive precedence over the often hastily fabricated acrylic temporary.

It is understandable, given that the primary objective of any provisional restoration is to promote gingival health prior to placement of the final restoration,² that the marginal integrity of provisional acrylic resin restorations (PRVs) has received an inordinate amount of attention.³⁻¹¹ However, the direct techniques that deal with marginal perfection are impractical in the clinical setting, for the most part, given the amount of time required to complete the remargination procedure.

Popularity of Direct Techniques

The superiority of the indirect technique of making PRVs has been amply documented.¹² Most clinicians favor the denser, more esthetic heat-cured acrylic restorations when a prolonged placement involving a periodontal prosthesis and complete-mouth rehabilitation is required. The disadvantages of laboratory heat-processed PRVs are increased cost as well as the special equipment and extended time required for their fabrication.¹³ Although indirect techniques that allow the acrylic resin to cure on a plaster cast are purported to result in a minimum loss of chair-time,¹⁴ they have not been assimilated by the profession.

The relative importance of provisional restorations is often incorrectly linked to their intended length of service. This will depend, to a large extent, on the number of days the laboratory requires to produce the definitive fixed prosthesis. However, the direct method of PRV fabrication, which may involve either complete or

partial curing of the resin on the preparation, seems to be favored¹⁵ for routine provisional restorations that have an anticipated duration of 10 days.

Marginal Perfection, Tissue Recovery and Optimum Cementation

Marginal perfection is critical to the placement of successful restorations — irrespective of their intended duration. PRVs must also allow the patient to properly cleanse the interproximal space. A splinted anterior embrasure may be more tolerable to a patient than splinted posterior PRVs, because the bucco-lingual distance of the anterior embrasure is smaller and the demand for dexterous skills is more reasonable. It is impractical to expect even the most compliant patient to manage the compromised embrasure areas of posterior splinted PRVs. The loss of interproximal epithelium, which is frequently seen on PRV removal, bears testimony to the unsurmountable difficulties of splinted provisional restorations.

The advantage of providing interproximal access in splinted PRVs can only be fully appreciated when it is understood that the duration of the temporary phase of the fixed dental restorative option

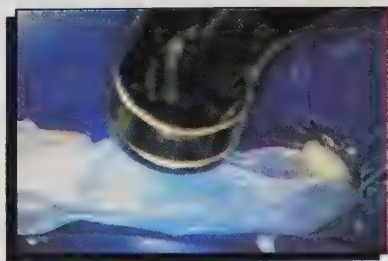


Fig. 4: The prepared teeth and surrounding gingiva are swabbed with a light coat of USP mineral oil to facilitate removal of the cured provisional acrylic resin restorations (PRVs). The Unifast LC is loaded into an applicator syringe and placed into the designated spaces of the over-impression. The indexed over-impression transparent resin loaded registration is then returned to the mouth and indexed to the opposing arch. The patient is instructed to gently bring the arches into contact with the registration. The PRVs are light cured from the exposed buccal peripheral margins by curing directly through the transparent over-impression.

is dependent on full gingival tissue recovery. During the interim between the preparation stage and the placement of the final prosthesis, temporary restorations must promote soft-tissue healing. Gingival overgrowth and inflammation are minimized by well-contoured provisional restorations with good marginal integrity.¹⁶

Trauma to the gingival margins can occur when the tooth is prepared to receive a crown. Loe and Silnes,¹⁷ however, consider such lesions to be reversible within eight to 14 days provided the wound is allowed to heal over a clean tooth surface. Furthermore, it has been proposed that if a good periodontal state of health is established interproximally before the final restoration is constructed, and if this state of health is not disturbed during the construction of the restoration, but exists on the day the restoration is delivered to the patient, a healthy soft-tissue interproximal papilla may be anticipated, without further loss of bone.¹⁸

It is important to understand that the integrity of the soft tissue acts as a barrier at the interface of the oral bacterial activity and the sterility of the underlying crest of bone. The buccal and lingual papillae are covered with stratified squamous epithelium, but the concavity of soft tis-

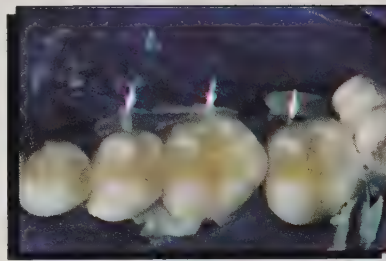


Fig. 5: The patient is instructed to open and further curing is done on the remaining surfaces. The over-impression is removed from the mouth, and final curing is accomplished with surface approximation of the restoration/light tip. Note how the three venting grooves in the over-impression (arrows) have allowed for the escape of excess resin as the patient occludes on the resin loaded over-impression.

sue connecting these peaks is covered with epithelia of only a few layers in thickness.¹⁹ It is understandable, therefore, that this interface of epithelia has the potential to serve as the weak link in the soft tissue's protection of the underlying osseous crest.¹⁸ Of more direct clinical relevance is the problem of maintaining a dry field during the permanent cementation of the definitive restorations. The hyperplastic, and often open-wounded, soft-tissue crater that results from an inadequately maintained interproximal gingival area is in no way conducive to cementation perfection.

Visible Light-Curing Composite Resins as Provisionals

The use of visible light-curing composite resins as provisional restorations has been reported in the literature.²⁰⁻²⁴ A clear matrix of 0.03-inch polypropylene splint material is traditionally thermoformed and/or vacuum formed over the working cast, as described by Ellman²⁵ and Preston.²⁶ The disadvantage of this technique is that it relies on the fabrication of working casts and, more importantly, produces an excess of marginal flash that protracts the contouring and finishing procedure.



Fig. 6: Using the sharp cutting edge of a stout curette or discoid excavator, the marginal excess is flicked away prior to removal of the PRVs. The exposed margins of the restorations are engaged and the restorations are lifted off the previously coated teeth. The remaining marginal flash is meticulously removed under magnification using an acrylic bur and/or diamond and plastic ultra-thin, safe-sided discs in preparation for an evaluation of the primary fit on reinsertion. The provision of a passageway for the mandatory threading of interproximal oral hygiene aids such as Superfloss (Oral B) is accomplished using discs.

Unifast LC (GC International) — which was introduced in 1990 — is a polymethylmethacrylate resin with a unique catalyst system. It is designed to autocure to a rubber-like stage, and then to achieve final set via visible curing light.²²

An irreversible hydrocolloid over-impression is made of the quadrant to be restored, the preparations are accomplished, and the powder-liquid resin paste is poured into the over-impression. At this point the impression is returned to its original position in the mouth, where it is held for two minutes. The provisionals are removed when they reach a rubber-like consistency, and excess material is removed using crown scissors. The provisionals are returned to the mouth and light-cured under occlusal pressure. The restorations are subsequently removed, and the unpolymerized areas are light-cured extra-orally. Finally, the provisionals are finished and cemented in the usual manner.

The major advantages of this hydrocolloid LC resin technique are the clinical time that is saved because the final set is light activated, and the superior polishability and reduced fragility provided by the improved formulation of the resin material. However, the major disad-

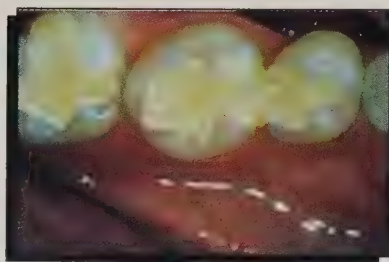


Fig. 7: Occlusal view of the provisional restorations 10 days after the cementation appointment. Note the acceptable marginal accuracy achieved with the single direct technique. There is no need to refine marginal accuracy with time-consuming secondary remargination techniques, as polymerisation shrinkage is minimised using this new technique.

vantages include an increased probability of shrinkage (due to the on/off/on technique) and a protracted finishing process because of the abundance of marginal flash.

Direct Techniques and Marginal Flash

Not surprisingly, the disadvantages that are common to each and every direct provisional technique relate to excess marginal flash. In this author's experience, the fabrication of provisionals that require only minimal flash reduction is more often the exception than the rule.

Marginal flash reduction is not only time consuming, the resulting over- and under-restorative extensions frequently make it impossible to achieve acceptable marginal accuracy. Furthermore, although marginal defects due to curing contraction are common, time-consuming remargination procedures are rarely used in clinical practice.

Excess marginal flash occurs due to the difficulty of returning the resin-filled over-impression to its original indexed position. This is caused not only by the flexural consistency of the alginate, but also by its bulkiness and the loss of prepared dental stops. In addition, the indexed impression needs to be properly orientated in all three dimensions. Consequently, it is not uncommon to see cured provisionals that are skewed in both dimension and position. Readers are encouraged to study earlier publications on direct fabrication, paying particular heed to

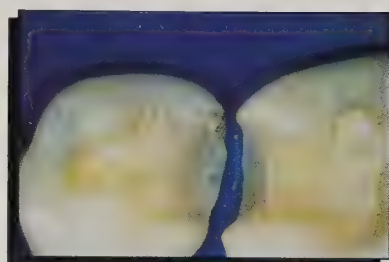


Fig. 8: Close-up occlusal view at the cementation appointment. The provisional restoration has permitted the interproximal sulcular area to return to a state of health, and it is scrupulously isolated for the duration of the adhesive cementation procedure.

the figures demonstrating the flange excess of resin provisionals prior to finishing.

Unfortunately, in most cases these figures typify, and at the same time simplify, the reality of the situation in clinical practice. The pre-finished provisional restoration is typically shown alongside the remarginated and polished provisional, with little indication of the effort that went into the finished restoration. The figures are frequently unintentionally misleading. Most authors will, if challenged, readily concede that the effort expended to achieve marginal perfection in the provisional restoration is often as time consuming as the cavity preparation itself.

The technique introduced in this paper relies on the use of a unique transparent over-impression registration material that minimizes the above disadvantages, and provides accurate provisional restorations, with minimal flash, at a fraction of the production time needed for the traditional over-impression method.

Case Report

A 31-year-old female patient presented for treatment with an open contact proximal to an improperly-contoured resin restoration displaying marginal degradation and mechanical failure. Her main complaint was that, despite her best intentions, she was unable to maintain the inter-dental area and it frequently bled on flossing. Her plaque control was, for the most part, excellent. With the exception of two small occlusal alloy restorations on



Fig. 9: Postoperative occlusal view of the mandibular sextant displaying corrected embrasure morphology and the esthetic realism of tooth-colored restorations. The excellent gingival recovery has been made possible, in part, by the marginal accuracy of the provisional restorations.

the first premolar, the adjacent teeth revealed radiographic and clinical evidence of recurrent decay (**Fig. 1**). The patient requested esthetic and functional restoration of the compromised sextant using tooth-colored restorations.

Technique

1. The restorative area is isolated. There are many isolation techniques that, when complemented by modern high-speed suction devices, will provide adequate isolation during the preparation and provisionalization of indirect restorative efforts. Rubber dam, while not essential to the prescribed technique, allows for unrivalled isolation perfection. This perfection is particularly important given current concerns about the spread of infectious disease agents in the dental office, and the profession's orientation toward barrier protection and universal precautions.²⁷ The intent of applying rubber dam is not to permit the fabrication of provisional restorations, *per se*. Rather, provisionalization forms part of the overall restorative procedure, which is completed within the luxury of rubber dam isolation.
2. A trayless over-impression is made of the working field (**Fig. 2**). This is done using a transparent silicone impression material (Memosil, C.D. Miles Inc., Ind., U.S.A.), which is applied directly from the cartridge dispenser to the restorative quadrant, taking care to accurately embody the full cervical gingival detail. The material is applied in sufficient bulk to provide adequate dimensional stability. A cotton roll is

then applied contra-laterally, and the patient is asked to gently close until contact is felt over the cotton roll. There should be enough impression material to record the outline of the rubber-dam-covered opposing arch. If contact is lacking, the patient is asked to open, additional material is extruded occlusally, and the teeth are brought back into proximation. By using alternative rubber dam retainers, this over-impression registration can be accomplished within the comfort of thorough isolation, as depicted in this case study.

3. The indexed over-impression transparent registration is then removed and set aside while tooth preparations are completed in the usual manner. The clinician cannot rely on the ceramist to block out undercuts in the laboratory phase, because provisional restorations must be fully cured intraorally.
4. The completed cavity preparations are coated with two layers of glycerine or Liquid Strip (Ivoclar North America Inc., Amherst, N.Y., U.S.A.). Due consideration is given to achieving full coverage, to ensure the undistorted lift-off of the fully-cured provisional restorations (Fig. 3).
5. Using a Bard Parker no. 11 scalpel blade, small escape channels are cut into the silicone over-impression alongside the prepared teeth. These channels facilitate the extrusion of excess resin when the over-impression is returned to its indexed position. This, in turn, minimizes the inevitable hyper-occlusion that is common to all direct over-impression techniques.
6. Mixed powder-liquid Unifast LC paste is then loaded into an applicator syringe for placement into the designated teeth of the over-impression.
7. The indexed over-impression transparent-resin loaded registration is then returned to the mouth and indexed to the opposing arch. The patient is instructed to gently bring the arches into contact with the registration. This is invariably accomplished without guidance. The transparent material allows for an evaluation of the positional accuracy of the reseated over-impression.
8. The provisional restorations are then light-cured from the exposed buccal peripheral margins

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- by curing directly through the transparent over-impression (Fig. 4).
9. The patient is instructed to open and further curing is done on the remaining surfaces.
 10. The over-impression is removed from the mouth, and final curing is accomplished with surface approximation of the restoration/light tip (Fig. 5). The high heat capacity and thermal conductivity of silicone impression material has been shown to provide sufficient heat dissipation when used with the conventional provisional acrylic resin materials.¹³ In addition, the polymethylmethacrylate resin of Unifast polymerizes at a lower temperature range, which reduces the problems associated with increased polymerization temperatures.
 11. Using the sharp cutting edge of a stout curette or discoid excavator, the marginal excess of the fully-cured PRVs is flicked off the unprepared portion of the teeth.
 12. The exposed margins of the restorations are engaged, and the PRVs are lifted off the previously coated teeth.
 13. The removed provisional restorations are trimmed and retried for accuracy of fit in the usual manner (Fig. 6). The interproximal areas are opened to allow for interproximal tissue development and, more importantly, a cervical flossing trough is detailed into the interproximal cervical area. This trough allows for the mandatory daily insertion and threading of Superfloss interproximally during the provisional period.
 14. Final impressions are recorded and the PRVs are lubricated externally with petroleum jelly to aid in the removal of the excess provisional cement. The tufted section of a length of Superfloss is tied around the splinted embrasure area of the provisional restorations. The prepared teeth are isolated and dried, and the restorations are sparingly loaded with provisional cement and transferred to the preparations. The floss is retrieved just before the final set of the provisional cement. The excess interproximal cement will adhere to the tufted floss, and will be effortlessly removed from the lubricated provisional margins as the floss is worked through the cervical flossing trough. The Superfloss also serves as a retrieval

line should the lubricated restorations accidentally be dropped during their intraoral passage.

15. Figs. 7, 8, and 9 demonstrate how effective the provisionalization technique has been. The gingival recovery of the postoperative view reflects the successful completion of this adhesive restorative option. ■

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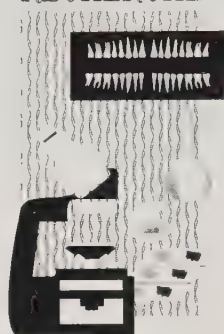
Dr. Liebenberg is in private practice in North Vancouver.

Reprint requests to: Dr. W.H. Liebenberg, 201-2609 Westview Dr., North Vancouver, B.C. V7N 4M2.

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RECHERCHE



Les patients porteurs de prothèses cardiaques : santé dentaire, procédures dentaires et prophylaxie

Sophie Lemay, DMD

Daniel Grenier, PhD

Lise-Andrée Mercier, MD, FRCP(C)

Sainte-Foy (Québec)

SOMMAIRE

Les patients souffrant de malformations congénitales ou rhumatismales du cœur ou possédant des valves cardiaques prothétiques ont des risques élevés de développer une endocardite bactérienne après un traitement dentaire. Deux cents patients porteurs de valves cardiaques ont été interrogés au sujet de leurs habitudes d'hygiène dentaire et leur dernier rendez-vous chez le dentiste. Plus de la moitié des répondants (112) étaient complètement édentés et la plupart n'avaient pas consulté un dentiste depuis plusieurs années. Sur les 88 répondants ayant des dents naturelles, 23 n'avaient pas vu un dentiste depuis leur intervention chirurgicale. Nous nous sommes intéressés plus particulièrement aux réponses des 65 patients qui ont consulté leur dentiste après leur intervention. Seulement 41 personnes (63 p. cent) ont indiqué avoir reçu une antibiothérapie prophylactique lors d'un traitement à risque de bactériémie. Sur les 24 répondants qui n'auraient pas reçu d'antibiothérapie prophylactique, 20 ont eu des traitements dentaires comportant un risque de bactériémie. À la lumière de notre étude, des recommandations devraient être émises dans le but d'améliorer les soins donnés aux patients sujets à une endocardite bactérienne.

ABSTRACT

Patients with birth or rheumatic heart defects, or wearing prosthetic cardiac valves, are at high risk of developing bacterial endocarditis following dental treatment. Two hundred patients with cardiac valves were surveyed with respect to both their oral hygiene habits and their last visit to the dentist. More than half of the respondents (112) were fully edentulous, and most of them had not seen a dentist for many years. Of the 88 respondents who had natural teeth, 23 had not been to a dentist since surgery. For the purpose of this study, focus was placed primarily on the answers given by the 65 patients who reported having been to a dentist after surgery. Only 41 of them (63 per cent) reported having received a prophylactic antibiotic therapy while being treated with a risk of bacteremia. Of the 24 others who did not receive prophylactic antibiotic therapy, 20 were given dental treatments with a risk of bacteremia. In light of this study, there should be recommendations to improve the health care given to patients predisposed to bacterial endocarditis.

Introduction

Les endocardites bactériennes sont des maladies résultant de la colonisation microbienne de la membrane endothéliale

recouvrant les surfaces internes du cœur de même que ses valves.¹ La mort résulte souvent d'une infection incontrôlable ou de dommages graves au cœur ou à d'autres organes. L'endocardite bactérienne peut être la complication d'une bactériémie, un passage transitoire de bactéries dans le sang circulant, chez les patients montrant des malformations congénitales ou rhumatismales du cœur ou possédant des valves cardiaques prothétiques.^{2,3} En effet, les bactéries du sang circulant ont une plus grande aptitude à adhérer à l'endocarde normal, d'où la susceptibilité accrue de ces patients à l'endocardite bactérienne. La sévérité de la bactériémie, la virulence de l'agent infectieux en cause de même que la résistance de l'hôte sont des facteurs qui favorisent l'endocardite. Finalement, la période d'incubation observée pour le développement de l'endocardite dépend de l'agent infectieux en cause.

Les microorganismes responsables des endocardites bactériennes sont habituellement les streptocoques ou les staphylocoques.⁴ Plus particulièrement, les streptocoques buccaux du groupe viridans, tels le *Streptococcus sanguis*, le *Streptococcus mutans*, le *Streptococcus oralis*, et le *Streptococcus mitis*, sont responsables de près de 50 p. cent des endocardites bactériennes.⁵⁻⁸ La

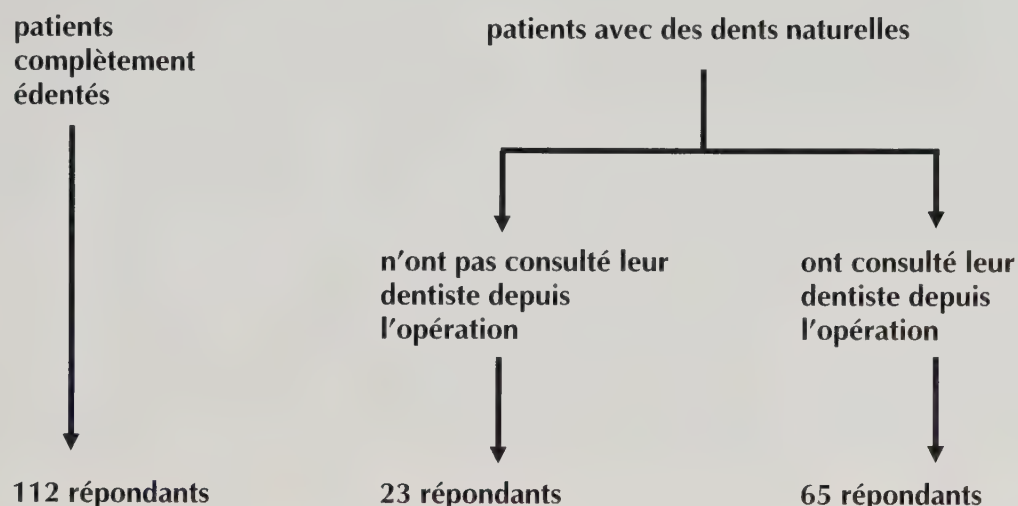
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Tableau I

État dentaire des patients ayant participé à l'étude

TOTAL : 200 répondants



dissémination de ces bactéries buccales dans la circulation sanguine peut s'effectuer après la mastication des aliments, le brossage des dents, une infection dentaire ou l'absence d'hygiène.^{4,9} Divers traitements dentaires comme une extraction, un détartrage, un curetage ou une gingivectomie peuvent également favoriser la bactériémie.¹⁰ Dans la majorité des cas cependant, la bactériémie est enrayée par les moyens naturels de défense de l'hôte et aucun effet secondaire n'est observé.

L'antibiothérapie prophylactique a pour but de réduire la sévérité de la bactériémie chez

les patients susceptibles à l'endocardite en prévenant l'adhérence bactérienne et en supprimant la croissance des bactéries qui auraient pu commencer à coloniser le cœur ou les valves cardiaques.¹¹ Les plus récentes recommandations de l'American Heart Association pour les patients à risque proposent une dose orale d'amoxicilline une heure avant le traitement dentaire, puis six heures après la dose initiale.¹² Pour les patients allergiques aux pénicillines tel l'amoxicilline, il est suggéré d'utiliser l'érythromycine. La prophylaxie n'assure cependant pas au patient une protection to-

tale contre l'endocardite bactérienne.¹³ Ainsi, une infection causée par des espèces bactériennes devenues résistantes à l'antibiotique peut se produire. Pour minimiser ce risque, il est suggéré au dentiste d'effectuer un grand nombre de travaux dentaires lors d'une même visite et d'espacer les rendez-vous.¹²

Le but de notre étude était d'évaluer, par sondage téléphonique, la santé dentaire de patients porteurs de prothèses cardiaques de même que la mise en oeuvre des moyens de prévention recommandés pour contrer l'endocardite bactérienne chez ce type particulier de patients.

Tableau II

Hygiène dentaire des patients ayant des dents naturelles.

		Ont consulté le dentiste depuis l'opération (n = 65)	N'ont pas consulté le dentiste depuis l'opération (n = 23)
Fréquence du brossage/jour		1,9 fois/jour	1,6 fois/jour
Soie dentaire	au moins tous les 2 jours	24/65	1/23 ¹
	pas du tout	41/65	22/23 ²
Saignement gingival lors du brossage	oui	17/65	9/23 ³
	non	48/65	14/23 ⁴

Selon une comparaison de proportions à l'aide d'un test Z : ¹ (p = 0.007), ² (p = 0.07), ³ et ⁴ NS

**Tableau III**

Interventions des professionnels de la santé auprès des patients sujets à l'endocardite bactérienne.

	Ont consulté le dentiste depuis l'opération (n = 65)	N'ont pas consulté le dentiste depuis l'opération (n = 23)
Le patient se souvient que son cardiologue lui a suggéré de consulter un dentiste régulièrement.	23/65	7/23
Le patient se souvient d'avoir rempli un questionnaire médical complet chez le dentiste	23/65	ne s'applique pas
Le dentiste est au courant de l'état cardiaque du patient	62/65	ne s'applique pas
Le patient a discuté de son problème cardiaque avec le dentiste	62/65	ne s'applique pas

Méthode

Deux cents patients, suivis par l'Institut de cardiologie de Montréal, ont été sélectionnés au hasard à partir d'une liste de 400 noms et ont consenti à participer à l'étude. Ces patients ont subi une intervention cardiaque entre janvier 1990 et décembre 1992 et sont porteurs de prothèses valvulaires depuis ce temps. L'âge, le sexe de même que le type et la position des valves cardiaques prothétiques n'ont pas été pris en considération. Tous les patients, après avoir obtenu leur congé de l'institut, ont reçu un enseignement de nursing très détaillé (oral et écrit) touchant le risque d'endocardite pour eux et les instructions pour prévenir l'infection.

Tous les patients ont été interrogés un à un par entrevue téléphonique et par une même personne, entre février et juillet 1994. Les questions posées portaient entre autres sur l'état et la santé dentaires du patient, sur la relation patient-dentiste, de même que sur la prise d'une antibiothérapie prophylactique lors du dernier traitement dentaire.

Résultats

Les 200 répondants qui ont accepté de participer à notre étude ont été divisés en deux groupes (Tableau I). Plus de la moitié, soit 112 personnes, étaient complète-

ment édentés. Nous avons analysé les réponses des 88 personnes ayant des dents naturelles. Sur ce nombre, 65 avaient vu au moins une fois leur dentiste depuis l'opération alors que 23 ne l'avaient pas encore consulté.

Les habitudes d'hygiène buccale des patients étaient meilleures chez ceux qui ont déclaré avoir consulté un dentiste depuis leur opération (Tableau II). Les 65 patients qui ont vu leur dentiste depuis l'opération se brossent les dents en moyenne 1,9 fois par jour; 24 de ceux-ci utilisent la soie dentaire au moins tous les deux jours et 48 ne notent pas de

saignement gingival lors du brossage. Sur les 23 personnes qui n'ont pas encore consulté leur dentiste, une seule utilise la soie dentaire au moins tous les deux jours et 14 disent ne pas noter de saignement gingival lors du brossage. Ces patients brossent leurs dents en moyenne 1,6 fois par jour.

Le médecin cardiologue ou omni-praticien et le dentiste sont des professionnels de la santé qui interviennent auprès des patients sujets à l'endocardite bactérienne (Tableau III). Dans environ un tiers des cas seulement (23/65 et 7/23),

Tableau IV

Types de traitements dentaires prodigués aux 65 patients porteurs de prothèses valvulaires ayant consulté leur dentiste.

Traitement	# Patients
Nettoyage	42
Restauration	25
Détartrage	10
Extraction	5
Traitement endodontique	4
Prothèse amovible	4
Chirurgie mineure	2
Examen/radiographie	2
Couronne/pont	1

Tableau V

Antibiothérapie prophylactique chez les patients ayant subi des traitements dentaires.

Les patients ont reçu une antibiothérapie lors d'un traitement à risque de bactériémie	41/65	avant traitement seulement	11/41
		après traitement seulement	1/41
		avant et après traitement	29/41
Les patients n'ont pas reçu une antibiothérapie lors d'un traitement à risque de bactériémie	20/65		
Les patients n'ont pas reçu une antibiothérapie parce que pas de traitement à risque de bactériémie	4/65		

le patient se souvient que son cardiologue lui a suggéré de consulter un dentiste régulièrement. Parmi les 65 répondants qui ont consulté leur dentiste, seulement 23 ont mentionné avoir rempli un questionnaire médical. Dans 95 p. cent des cas (62/65), le dentiste a toutefois été mis au courant de l'état cardiaque particulier du patient après une discussion avec celui-ci.

Le détail des traitements dentaires qui ont été prodigués aux patients porteurs de prothèses cardiaques est présenté dans le **Tableau IV**. Chez ces personnes, 41 ont reçu une antibiothérapie prophylactique lors d'un traitement à risque de bactériémie; 11 d'entre elles ont pris les antibiotiques avant le traitement seulement, une personne après le traitement seulement et 29 avant et après le traitement (**Tableau V**). Finalement, 20 personnes disent n'avoir pris aucun antibiotique malgré un risque de bactériémie. Parmi celles-ci, un patient a développé une endocardite bactérienne après une chirurgie mineure (greffe gingivale).

Conclusion

Dans la présente étude, le sondage a été restreint à des patients porteurs de valves cardiaques puisqu'il est reconnu par l'American Heart Association que ces personnes présentent un haut risque de développer une endocardite bactérienne après un traitement dentaire.¹² L'antibiothérapie prophylactique est donc d'une importance primordiale pour ce type particulier de patients.

Tous les patients de l'Institut de cardiologie de Montréal reçoivent

à leur sortie des instructions (orales et écrites) précises concernant le risque d'endocardite pour eux notamment lors de procédures dentaires. Il nous apparaît toutefois que les patients ne semblent pas encore suffisamment conscients de l'importance de leur santé dentaire par rapport à leur état cardiaque particulier. La majorité des personnes ne possédant plus leurs dents naturelles n'avaient pas consulté de dentiste depuis environ cinq ans. Même si le risque de bactériémie d'origine buccale chez ces personnes est plutôt faible, il serait quand même

souhaitable qu'elles consultent un dentiste pour le diagnostic de maladies comme les stomatites et les ulcères lesquelles peuvent résulter du port de prothèses dentaires inadéquates. En effet, ces états pourraient favoriser la bactériémie et ainsi augmenter les risques d'endocardite bactérienne.^{14,15} Il est difficile d'évaluer précisément la qualité de l'hygiène buccale sans examen clinique puisque la technique et la fréquence du brossage sont des facteurs importants à considérer. Il est bon de mentionner que le saignement gingival noté chez plusieurs patients n'est peut être pas



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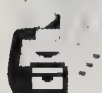
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dû à une mauvaise hygiène, mais plutôt à la prise d'anticoagulant chez ce type particulier de patients.

Les résultats obtenus au sujet de la prise d'une antibiothérapie prophylactique lors d'un traitement dentaire ne sont pas aussi alarmants que ceux rapportés dans une étude scandinave réalisée en 1989.¹⁶ Dans ce cas particulier, 220 patients porteurs de valves cardiaques prothétiques avaient répondu à un questionnaire portant sur leur état dentaire et leur dernière visite chez le dentiste. Parmi ces patients, dont 30 p. cent étaient édentés, 50 p. cent ont indiqué qu'ils consultaient leur dentiste au moins une fois par année. Toutefois, seulement 16 p. cent (20/124) des patients porteurs de prothèses cardiaques avaient reçu une antibiothérapie prophylactique lors d'une extraction, d'un détartrage ou d'un traitement endodontique. Dans notre étude, près de 70 p. cent des patients ayant subi un traitement dentaire à risque de bactériémie ont dit avoir reçu une antibiothérapie prophylactique. Toutefois, on ne peut pas savoir si l'antibiothérapie donnée respecte les recommandations de l'American Heart Association concernant le choix de l'antibiotique, la dose administrée et la posologie.

Les résultats de notre étude suggèrent qu'il faudrait établir un protocole plus rigoureux pour informer adéquatement les patients de l'importance que représente l'hygiène buccale pour leur état cardiaque particulier. Ceci est amplement justifié par le fait qu'il semble que la plupart des cas d'endocardite d'origine buccale ne seraient pas causés par des procédures dentaires, mais plutôt par une mauvaise hygiène buccale conduisant à une gencive enflammée sujette au saignement.¹⁷ Lorsqu'un patient développe une endocardite, le médecin lui demande s'il a reçu des traitements dentaires au cours des derniers six mois. Dans l'affirmative, le traitement dentaire est alors considéré comme étant à l'origine de l'endocardite. Toutefois, il a été déterminé que la période de temps entre l'invasion bactérienne et l'apparition des symptômes d'une endocardite à

streptocoques est relativement courte, allant de quelques jours à 2 semaines dans la majorité des cas.¹⁸ Il apparaît donc que de bonnes habitudes d'hygiène buccale constituent une importante mesure de prophylaxie préventive contre les endocardites. Il serait ainsi souhaitable que tous les patients prennent rendez-vous avec leur dentiste pour un examen, des instructions d'hygiène et l'inscription à leur dossier de leur nouvel état cardiaque. Enfin, une collaboration étroite devrait s'établir entre dentistes et cardiologues pour la prescription de l'antibiothérapie prophylactique. Celle-ci devrait être basée sur les recommandations de l'American Heart Association.¹²

Finalement, il serait intéressant d'effectuer une étude similaire auprès des dentistes de façon à faire une mise au point de leurs connaissances sur le sujet. Quels patients sont sujets à l'endocardite bactérienne? Quels sont les traitements nécessitant une antibiothérapie prophylactique? Comment prescrire l'antibiothérapie prophylactique? ■

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D^r Sophie Lemay est une dentiste en clinique privée à Laval et chargée de clinique à l'Université de Montréal.

D^r Daniel Grenier est professeur agrégé à la Faculté de médecine dentaire de l'Université Laval et membre du Groupe de recherche en écologie buccale.

D^r Lise-Andrée Mercier est cardiologue à l'Institut de cardiologie de Montréal et professeure adjointe clinique au Département de médecine de l'Université de Montréal.

Demandes de tirés à part : D^r Daniel Grenier, Groupe de recherche en écologie buccale, Faculté de médecine dentaire, Université Laval, Sainte-Foy (Québec), G1K 7P4.

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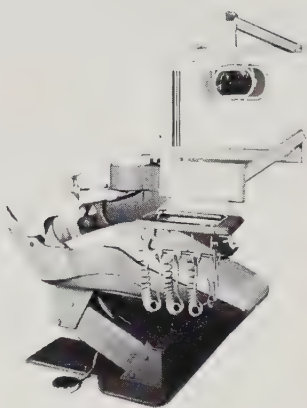
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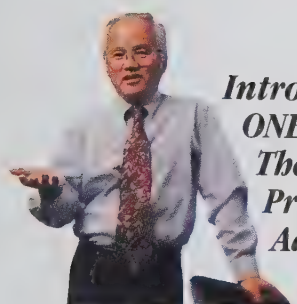
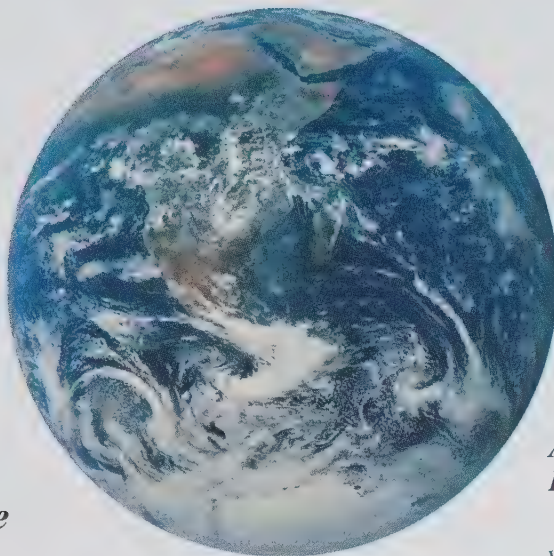
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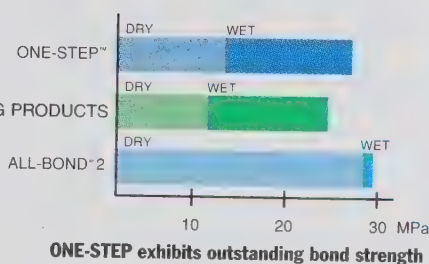
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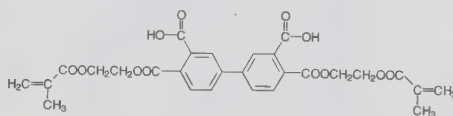
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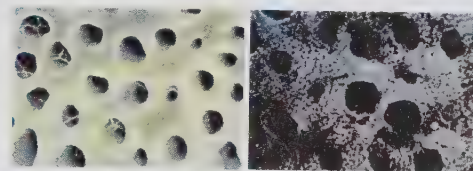


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2. Kanca, J.J. "Etchant Composition and Bond Strength to Dentin", Am J Dent 1993;6:162-164.
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4. Brannstrom, M., Nyborg, H. "Cavity Treatment with a Microbicidal Fluoride Solution: Growth of Bacteria and Effect on the Pulp", J. Prosthet. Dent., Vol. 30, pg. 303-310, Sept 1973.

* US Patent #5,348,988 + US Patent #5,385,728 ‡ moist does not mean saliva or blood contaminated
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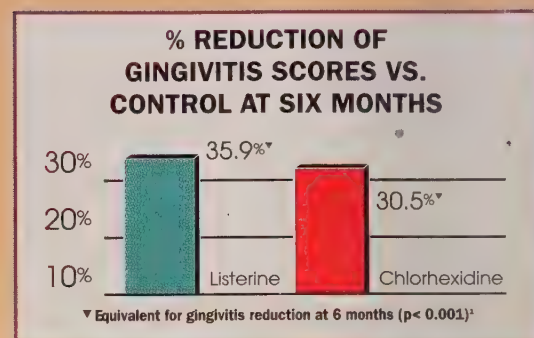
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Overholser CD et al. Comparative effects of two chemotherapeutic mouthrinses on the development of supragingival dental plaque and gingivitis. J Clin Periodontol 1990;17:575-579

2. Data on file, 1995

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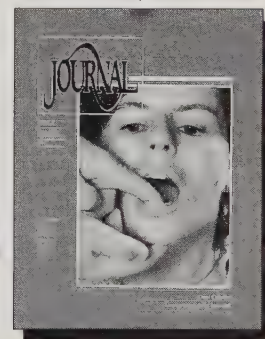
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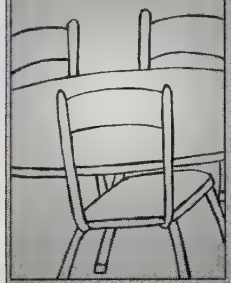
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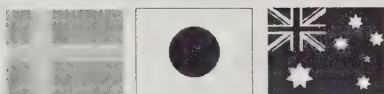
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MEETINGS & COURSES



INTERNATIONAL



October 23-27

83rd FDI Annual World Dental Congress in Hong Kong. Contact Laura Stephenson (613) 523-1770 ext. 246.

October 31-November 4

Centenary Congress — 28th International Dental Meeting in Buenos Aires, Argentina and sponsored by the Asociación Odontológica Argentina. Contact Dr. Guillermo Pisarenko, president, Junin 959, (1113) Buenos Aires, Argentina. Tel: (1) 961-6141, or fax: (1) 961-1110.

November 15-17

Annual Congress of the Swedish Dental Society in Stockholm, Sweden. Contact Charlotte Nackstad, Swedish Dental Society, Box 5843, S-102 48 Stockholm, Sweden. Tel: (8) 666 15 00, or fax: (8) 662 58 42.

January 19-23, 1996

18th Asian Pacific Dental Congress & 50th Indian Dental Conference in Bombay, India. Contact Dr. Ashok Dhoble, Organizing Secretary, 18th A.P.D. & 50th I.D.C., 534 Bombay Mutual Terrace, 2nd Floor, Sandhurst Brige Opera House, Bombay 400 007 India. Tel.: 91-22-361 0248, or fax: 91-22-367 2627.

CANADA



October 11-14

6th Annual Conference of the Canadian Association for Suicide Prevention (CASP)/6e Congrès annuel de l'Association canadienne pour la prévention du suicide (ACPS) in Banff, Alberta. The theme of this conference is Building Connections for Suicide Prevention. Contact the Canadian Association of Suicide Prevention, c/o Suicide Information & Education Centre, 201-1615 10th Ave. S.W., Calgary, Alta. T3C 0J7. Tel.: (403) 245-3900, or fax: (403) 245-0299.

October 14

Advanced Periodontal Instrumentation. Presenter: Anna Matsuishi Pattison, RDH, MS Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

October 14

University of Manitoba "Homecoming '95" — The Application Of Recent Advances In Oral Biology To Clinical Practice. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

October 20

Dental Materials Review and Update. Contact the University of Western Ontario, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax: (519) 661-3875.

October 20

Southern Ontario Surgical Orthodontic Study Group Meeting in Windsor, Ont. Contact Dr. Jeff Berger (519) 258-2632, or fax: (519) 258-2637.

October 20

The George Hare Endo Study Club presents an all day lecture in endo-

dontics. Dr. John West on "The Total Endodontic Experience." Contact Dr. Chris Tasios (416) 751-8400.

October 20

The Kingston Region Implant and Prosthetic Study Club presents "Occlusion in Implantology" with Dr. Cliff Fox of Akron, Ohio. Contact Rick King 1-800-561-1723.

October 20-22

21st Century Ceramic Symposium in Vancouver, B.C. Contact Ms. Mary Thomas, Vancouver Seminar for Dentistry, 280-7580 River Rd., Richmond, B.C. V6X 1X6. Tel.: (604) 278-5426, or fax: (604) 278-6864.

October 21

A Review of Current Endodontic Concepts & Review of the Cracked Tooth Syndrome. Co-sponsored by The Annapolis Valley Dental Association and Dalhousie University. Presenter: Dr. Joseph J. Williams. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

October 26-27

Bridging Communities, Building Futures, 24th Annual Scientific and Educational Meeting of the Canadian Association of Gerontology at the Hyatt Regency Hotel, Vancouver, B.C. For registration information write to: Conference Secretariat, c/o Gerontology Research Centre, Simon Fraser University, 515 W. Hastings, Suite 2800, Vancouver, B.C. V3B 5K3. Tel.: (604) 291-5062, or fax: (604) 291-5066.

October 27-28

Guiding the Developing Dentition. Guest speaker: Dr. Jon T. Kapala. Contact the University of Western Ontario, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

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October 27-29

Workshop Meeting of the Canadian Association of Dental Consultants in Toronto, Ont. Contact Dr. W. Norgate, 901 St. Mary's Rd., Winnipeg, Man. R2M 3R4.

October 28

Older Dental Patients: Clinical Challenges and Practical Approaches. Presenter: Dr. Kenneth Shay. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

October 28-31

Annual Meeting of the Great Lakes Association of Orthodontists in Toronto, Ont., at the Westin Harbor Castle Hotel and Convention Centre. Contact Dr. Paul C. Levin, General Chairman, 4288 Village Centre Court, Mississauga, Ont. L4Z 1S2. Tel. (905) 275-8501, or fax: (905) 275-5213.

November 2-4

University of Manitoba — Introductory Acupuncture For Dentists. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

November 3-4

How to do Selective Orthodontics in the General Practice — Modules 3 and 4. Co-sponsored by Space Maintainers Laboratories and Dalhousie University. Presenter: Dr. Walter Pfitzinger. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 4

Infection Control. Presenters: Heather Bowers, RDA and Cathy MacLean, BN. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 4

Oral Pathology and Panoramic Radiology. Contact the University of Western Ontario, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1.

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LOCAL ANESTHETIC FOR DENTAL USE.

Indications

Ultracaine is indicated for infiltration anesthesia and nerve block anesthesia in clinical dentistry.

Contraindications

Ultracaine is contraindicated in patients with a known hypersensitivity to any of its components and/or local anesthetics of the amide group; in the presence of inflammation and/or sepsis near the proposed injection site; in patients with severe shock; in patients with any degree of heart block; in patients with paroxysmal tachycardia; in patients with known arrhythmia with rapid heart rate; in patients with narrow-angle glaucoma; in patients with cholinesterase deficiency; in patients with existing neurologic disease and in patients with severe hypertension.

When Ultracaine with epinephrine is used, the caution required of any vasopressor drug is in order.

Warnings

As with other local anesthetics applied to the head and neck area, life-threatening or fatal shock, respiratory or cardiac arrest may rarely occur with Ultracaine.

Methemoglobinemia

As with any local anesthetic, Ultracaine may rarely produce methemoglobinemia: this has been observed when an intravenous regional anesthesia technique was used. Ultracaine, when used as directed in dental procedures, was not associated with methemoglobinemia.

Methemoglobinemia values of less than 20% usually do not produce any clinical symptoms. The usual clinical signs of methemoglobinemia are cyanosis of the nail beds and lips. Although the possibility of methemoglobinemia occurring in dental patients is extremely rare it can be rapidly reversed by the use of 1-2 mg/kg body weight of methylene blue administered intravenously over a 5-minute period.

Usage in Pregnancy

Animal studies have not demonstrated teratogenic or embryotoxic effects of Ultracaine. However, safe use in pregnant women has not been established. Ultracaine is unlikely to be transferred to the mother's milk since it is rapidly decomposed and eliminated.

As with other local anesthetics, Ultracaine has been shown to cross the placental barrier after peridural administration.

Precautions

General

Resuscitative equipment and drugs should be readily available when any local anesthetic is used. The safety and effectiveness of local anesthetics depend upon proper dosage, correct technique, adequate precautions and readiness for emergencies. Ultracaine should be used cautiously in persons with known drug allergies or sensitivities, or suspected sensitivity to the amide-type local anesthetics.

The following precautions apply to all anesthetics: avoid excessive premedications with sedatives, tranquilizers, and antiemetic agents, especially in infants, small children and elderly patients. Inject slowly with frequent aspirations and if blood is aspirated, relocate needle. Keep dosage, including the concentration and total volume of solution, as low as possible, with due regard to the age, weight, and physical status of the patient and the vascularity of the area injected. Absorption is greater when injections are made into a highly vascular tissue. The lowest dosage that gives effective anesthesia should be used to avoid high plasma levels and serious systemic side effects.

In children and elderly patients, as well as in patients of all ages with chronic or debilitating disease, the response to local anesthetics may be modified (see Dosage and Administration).

Patients with Special Diseases and Conditions

The use of a local anesthetic containing a vasoconstrictor in areas with a limited blood supply or in patients with peripheral vascular disease, will depend on an appraisal of the relative advantages and risks.

Ultracaine should be used with extreme caution in patients whose medical history and physical evaluation suggest the existence of thyrotoxicosis or diabetes.

Owing to the sulphite component, hypersensitivity reactions may occur occasionally in patients with bronchial asthma and, very rarely, in other patients.

Drug interaction

Solutions containing a vasoconstrictor, e.g. epinephrine, should be used with caution, if at all, in patients who are receiving MAO inhibitors or tricyclic antidepressants, because severe, prolonged hypertension may result.

Dose-related cardiac arrhythmias may occur if preparations containing epinephrine are employed in patients during, or immediately following, the administration of enflurane, halothane, or other halogenated anesthetics.

Adverse Reactions

Persistent paresthesia of the lips and oral tissues have been reported after blocking the inferior alveolar nerve.

Reactions to Ultracaine are characteristic of those associated with amide-type local anesthetics and/or vasoconstrictors.

A major cause of adverse reactions to this group of drugs is excessive plasma levels, which may be due to overdosage, inadvertent intravascular injection, or slow metabolic degradation. Other causes of reactions to these local anesthetics may be hypersensitivity, idiosyncrasy, or diminished tolerance.

Dosage and Administration

As with all local anesthetics, the dosage varies and depends upon the area to be anesthetized, the vascularity of the tissues, the number of neuronal segments to be blocked, individual tolerance and the technique of anesthesia. The lowest dosage, needed to provide effective anesthesia should be administered.

A test aspiration should always be performed before injection, in order to avoid intravascular injection. The pressure of the injection must be adapted to the sensitivity of the tissue.

	Ultracaine D-S forte		Ultracaine D-S	
Procedure	Volume (mL)	Total Dose (mg)	Volume (mL)	Total Dose (mg)
Infiltration	0.5-2.5	20-100	0.5-2.5	20-100
Nerve Block	0.5-3.4	20-136	0.5-3.4	20-136
Oral Surgery	1.0-5.1	40-204	1.0-5.1	40-204

It is recommended that the dosage should not exceed 7 mg/kg body weight in adults.

To date, Ultracaine has not been administered to children under 4 years of age, nor in doses greater than 5 mg/kg in children between the ages of 4 and 12.

Supply

Ultracaine D-S: 4% with epinephrine (1/200,000) and Ultracaine D-S forte: 4% with epinephrine (1/100,000) are available in 1.7 mL cartridges, box of 50 cartridges.

Product Monograph available on request.

Reference:

1. Lemay H et al: Ultracaine in conventional operative dentistry. *Journal of the Canadian Dental Association* 1984; 50 (No.9): 703-708.

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Tel.: (519) 661-3902, or fax (519) 661-3875.

November 18

Rationale for Antibiotics in Periodontics. Presenters: Dr. Dan Price, Dr. Crawford Bain, Dr. Gary Foshay and Dr. Terrie Logue. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 18

University of Manitoba — Are Implants For Your Practice? Presenter: W. Brock Love, DMD, M.Sc. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

November 18

University of Manitoba — A Dental Hygienist's Perspective On The Monitoring And Maintenance Of Dental Implants. Presenter: Janice Wood, Dip. D.H. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

November 25

University of Manitoba — Income Tax Planning For Dentists. Presenter: Dr. Jack Stockton. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

November 30 - December 2

Crown and Bridge Back to Basics. Contact the University of Western Ontario, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

December 2

Bonded Restorations: How to Make An Informed Choice in Selecting Materials and Techniques. Presenter: Dr. A. John Gwinnett. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

December 2

University of Manitoba — The Alpha Omega Memorial Lecture: Oral Manifestations Of Infection Disease with Sol Silverman Jr., DDS, MA. Contact Darcy Duggan

(204) 789-7331, or fax: (204) 888-4113.

January 12-13, 1996

1- Assessment and Management of Medical and Dental Emergencies, 2- Oral Surgery Solutions to Help the Clinician Solve Common Clinical Problems for the Dental Patient. Presenters: Dr. Archie Morrison and Dr. Reginald Goodday. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

U.S.A.



September 15-16

The American Dental Association, Michigan Dental Association and West Michigan Dental Society are proud to celebrate during 1995 the **50th Anniversary of Community Water Fluoridation in the United States.** An international symposium on community water fluoridation will be held at the Van Audel Center in Grand Rapids, Michigan. Contact Dr. Arnold Morawa or Ms. Debbie Montague, University of Michigan School of Dentistry, 1011 N. University Ave., Ann Arbor, Mich. 48109-1078. Tel: (313) 764-6856, or fax: (313) 936-3065.

October 4-6

58th Annual Meeting of The American Association of Public Health Dentistry — Call for Abstracts. The AAPHD is inviting papers on a broad range of dental public health topics for presentation at its annual meeting. The theme of this year's meeting is "Oral Health: The Primary Care and Prevention Model." Deadline for submission was May 1, 1995. Contact AAPHD National Office, 10619 Jousting Lane, Richmond, Va. 23235-2828. Tel: (804) 272-8344, or fax: (804) 272-0802.

October 7-11

136th Annual Session of the American Dental Association in Las

Vegas, Nevada. Contact the American Dental Association, 211 E. Chicago Ave., Chicago, Ill., 60611. Tel.: (312) 440-2658, or fax: (312) 440-2707.

November 16-18

Annual Meeting of the Academy of Dental Materials in San Diego, California. Contact the Academy of Dental Materials, c/o ARDEL Mangement, Inc., 6518 Walker St., Suite 150, Minneapolis, Minn. 55526-4244. Tel.: (612) 927-6707, or fax: (612) 927-8127.

November 27-28

American Board of Oral and Maxillofacial Radiology 1995 — Certifying Examination. Applications must be submitted by May 15, 1995. Contact Dr. Curtis Lundeen, School of Dentistry — Oral Radiology, Oregon Health Sciences University, 611 S.W. Campus Dr., Portland, Ore. 97201-3097. Tel: (503) 494-8930.

December 25 - January 1

Alpha Omega International Dental Fraternity — Annual Convention in Tarpon Springs, Florida. Contact Stephanie Block, executive director, 206-1314 Bedford Ave., Baltimore, Md., 21208. Tel.: (410) 602-3300, or 1-800-677-8468.

January 25-28

"Coming of Age," 21st Yankee Dental Congress, Hynes Convention Centre, Boston, Massachusetts. More than 250 scientific presentations and 550 technical exhibits. Contact Dr. James N. Thiel, General Chair, Massachusetts Dental Society, 83 Speen Street, Natick, Mass. 01760-4144. Tel.: (508) 651-7511.

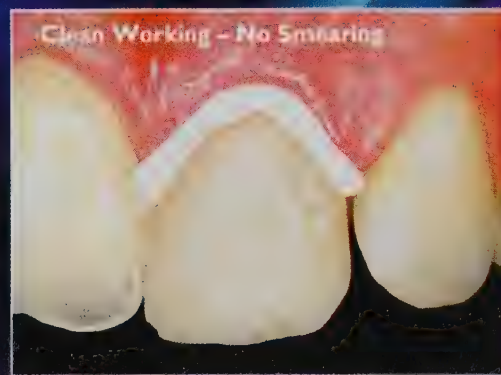
Notices of meetings and continuing education courses are published without charge for appropriate **not-for-profit** dental organizations, teaching facilities or recognized study clubs. Information must be received two months prior to expected publication date, and will be published at the discretion of the editor. Send all requests C/O Ms. Rachel Galipeau, *Journal* editorial assistant, Canadian Dental Association, 1815 Alta Vista Dr., Ottawa, Ont. K1G 3Y6.



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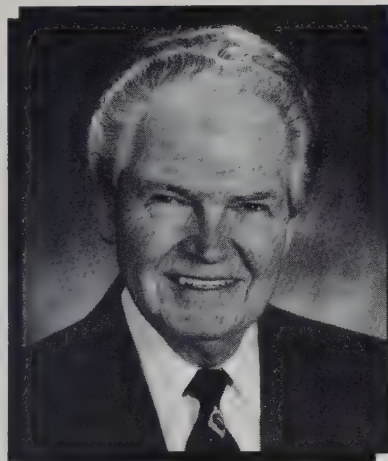
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EDITORIAL

IT'S NOT ABOUT THE POINTS



Dr. P. Ralph Crawford,
Editor

This month, with the launch of the Self-Learning/Self-Assessment program in the *Journal*, we've joined the growing ranks of dental publications across North America which offer readers a participatory continuing dental education program.

From the outset, when we first began considering the addition of a continuing education component to the *Journal*, our intent was to offer a high-quality, high-value program. We didn't want our program to be one more easy way for dentists to earn continuing education points, we wanted it to be an enjoyable, thought-provoking learning experience.

We ultimately chose Self-Learning/Self-Assessment, or SLSA for short, not only because we think it's the best program of its kind in Canada, but also because its primary objective — to provide a mechanism which encourages, stimulates, and assists general practitioners to achieve and maintain a high standard of care and professional performance — is so close to our own goals for a CE program.

Beginning this month, the *Journal* and SLSA will present a series of 20 questions, answers, rationales, and references, followed by a series of 20 reversal questions, answers, rationales and references, all pertaining to situations of clinical

importance that dentists may face in day-to-day practice. The reversal questions have been developed specifically to test how well each participant grasps the concepts and techniques presented in the first series of questions, answers and rationales.

Each yearly cycle of questions and reversal questions will conclude with a 15-question quiz to test dentists on what they have learned, and to meet provincial requirements for the awarding of mandatory continuing dental education points. A number of provincial licensing authorities do not accept the legitimacy of simple "check the right answer" programs — they require proof that there has been actual cogent participation by the dentist.

The 1995-96 quiz will be presented in the June 1996 issue of the *Journal*, with the answers slated to appear in the August 1996 issue. Dentists who wish to participate in the SLSA program for CE points must return the completed quiz to CDA by August 15. The names of participating dentists will then be forwarded to their respective licensing bodies — all of which currently recognize SLSA for continuing education credits.

Contrary to what many dentists in Ontario may believe, mandatory continuing dental education — and the quest for CE points — is not a new phenomenon. The State of Minnesota began the first such program in North America in 1969, and at least four Canadian provinces followed suit in the 1970s. Still, it may be only natural that more emphasis was given to mandatory CE, and that there was a decided proliferation of CE programs of every type, when the Royal College of Dental Surgeons of Ontario adopted its mandatory continuing dental education requirement in 1993. After all, bringing more than 5,000 new dentists into the mandatory CE fold by the stroke of a legislative pen has a tendency to attract attention.

Unlike some of the more recent additions to the CE stable, SLSA is a tried and tested program. It has enjoyed a quiet, thoughtful evolution since 1982, when the National Dental Examining Board (NDEB) first began to explore the need for a Canada-wide CE program. Two

years later, in 1984, the NDEB developed a SLSA proposal and distributed it widely to all licensing authorities, dental associations and learning institutions. By 1987 a SLSA pilot project involving 800 dentists had been initiated with financial support from CDA, the NDEB and the Canadian Fund For Dental Education (now the Dentistry Canada Fund). The questions and answers, etc., for this initial program were provided by the Association of Canadian Faculties of Dentistry.

From the outset, SLSA proved to be a valuable learning experience for dentists. Unlike other dental journal CE programs, it involves considerably more than merely "checking off" a correct answer (guess?) in an appropriate box, sending in a card, and then waiting for the correct "a,b,c,d" answer to be published a couple of months later. It's designed first and foremost to be a learning tool.

As readers may have guessed, this editor has never been greatly enamored with mandatory continuing education. Although I have been a participant since Manitoba introduced the first Canadian CE program in Canada in the early '70s, I have never been convinced that mandatory learning will make a poor dentist a better dentist. It's the old horse to water routine. You can force dentists to participate, but you can't force them to learn.

We can, however, make the opportunity for learning available, and we can encourage dentists to participate. This is what the *Journal's* decision to carry SLSA is all about. We invite all dentists to investigate the SLSA program, and plead with you to use it for what it is — a vehicle for quality self-learning and self-assessment. We also thank A-dec, Colgate, the Fowler-Pearce Partnership (Nesbitt Burns), Nobelpharma, and Sci-Can for their sponsorship of the program. Their support has been invaluable.

In the words of St. Thomas Aquinas: "Of all human pursuits, that of wisdom is the most perfect, the most sublime, the most profitable, the most delightful."

P. Ralph Crawford, BA, DMD
Editor of the *Journal of the Canadian Dental Association*

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SYSTEMS FOR SUCCESS

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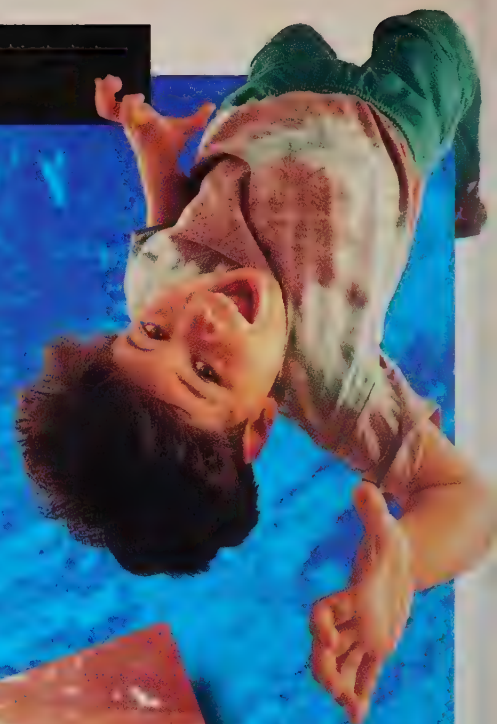


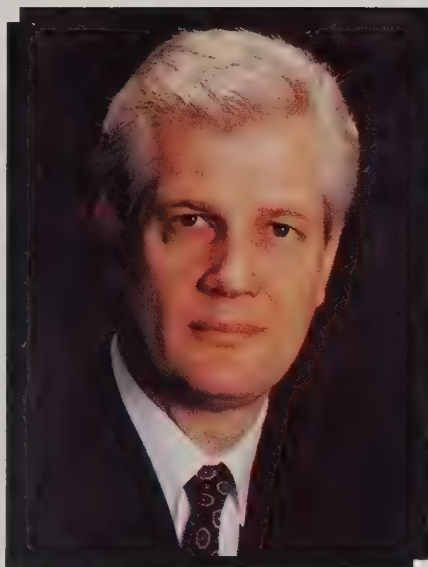
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Dr. Jim Brookfield

Meet Dr. Jim Brookfield: CDA President (1995-96)

Terence Davis, BA, Dip. J., CAE

If you ask Dr. Jim Brookfield why he lives and works in a town where winter hits hard for six months of the year, chances are that he'll tell you about the beauty of a Northern sunset, or the feel of crisp, white snow under your boots. Or he may opt to talk about the winter activities that abound in the North, from cross-country skiing, skating and snowshoeing to tobogganing and snowmobiling.

What he likely won't talk about are the mornings when he's opened his back door to -30° C temperatures and had to shovel a foot of snow off the driveway, or the times when he's had to put on his heavy parka and walk to work because the family Suburban wasn't plugged in and wouldn't start.

In Kirkland Lake, where Dr. Brookfield has practised since his graduation from the University of Toronto's dental faculty in 1971, you take the good with the bad and get on with things. And if the going ever gets really tough, the entire community of 12,000 pitches in to put things right. That's what life in the North is all about.

"It's common to develop closer relationships with your patients," explains Dr. Brookfield. "You seem to know everyone and a bit of their background... There's not

much that happens around here without everybody knowing about it, and the community pulls together when extra support is needed. Our numbers may be few, but our community spirit is consistent and obvious."

If you happened to be walking about in Kirkland Lake today, it's likely that nine of 10 people you stopped on the street could not only direct you to Dr. Brookfield's office, they'd also know that he was installed as the president of the Canadian Dental Association August 25 in Ottawa. And if you took the time to strike up a conversation, they might even mention that he's already served a term as president of the Ontario Dental Association (1987-88), or that he's a past-president of the Northern Ontario Dental Association (1980). That's what small towns are like — there's not a lot of secrets.

Another reason that so many Kirkland Lake residents know Dr. Brookfield is that he and partner Dr. Bill Burgman maintain the only dental office in town. With a total staff of 26, including six dentists and four hygienists, it's a busy place.

"We service a wide surrounding area," said Dr. Brookfield. "Referrals from Kirkland Lake aren't

"... my day is fast-paced and busy, and it definitely keeps me on my toes."

easy, so our office is well equipped, and we service our patients in all aspects of dentistry."

In a typical practice day, Dr. Brookfield sees approximately 20 patients. He also examines 10, or so, patients who have come in to see his hygienist. It's a busy schedule and it's easy to fall behind. More often than not, Dr. Brookfield's lunch break consists of a 10-minute sandwich and cup of coffee, just to keep his afternoon appointments on time.

"In a nut shell, my day is fast-paced and busy, and it definitely keeps me on my toes," he said.

Given his schedule, it's hard to imagine how Dr. Brookfield found the time to become involved in organized dentistry, let alone to keep on top of all the issues affecting the profession. But it has been a part of his life ever since he teamed up with Dr. Burgman in 1971 and established his practice.

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Following his installation as president of the Canadian Dental Association, Dr. Jim Brookfield presents the past-president's plaque to Dr. Bryn Sigfstead.

"In his office it was the natural thing to do — support your profession. Under his guidance I was asked to organize the Northern Ontario dental convention as its president. Then it was on to the ODA board as the regional representative there.

"I didn't set out with the goal of becoming president of ODA or president of CDA, but the scope of my experience at the local level, helpful peers, and my willingness to seize opportunities, ultimately led me to where I am today. If I knew then what I know now, I would have been much more eager to take the plunge into dental politics."

Time will tell if Dr. Brookfield feels the same way 12 months from now, after he's led CDA through the complex web of issues confronting the dental profession in 1995-96. His immediate concern will be to build on the success of CDA's "Enough is Enough" campaign against the taxation of employer-sponsored dental plan premiums, which he believes is still the "most ominous issue in front of us today." But he will also have to help dentistry come to grips with the amalgam controversy, ongoing concerns over fluoride, the influx of managed care, and ongoing changes to the structure of third-party benefit plans.

"CDA must be in a position to manage the change and protect the oral health of Canadians," said Dr. Brookfield. "We have done this for decades, we have had success that is envied by all other professions, and we must continue to do so. At the same time, we must be careful not to duplicate the services and strengths of the provincial associations. We must be a national leader on issues, and complement the good work being done in the provinces."

The first step in this process will occur when CDA puts the finishing touches on its new MP contact program, which was initiated earlier this year. The program will seek the support of dentists from across Canada to maintain the political pressure against the taxation of employer-sponsored dental plans. Over the longer term, it will provide CDA with a mechanism to keep MPs informed about dentistry's concerns, as well as about issues that could have an impact on the oral health of Canadians.

At the same time, CDA will continue to be an active member in the health benefits coalition. Formed last year to lobby against the taxation of dental and health plan premiums, the coalition is currently seeking solutions to the equity issue that will allow all Canadians to enjoy equal access to tax-free oral care.

The taxation of employer-sponsored dental plan premiums is still the "most ominous issue in front of us today."

"Last year, dentists from across Canada worked hard and in unison to protect our patients' oral health, and showed the strength of a cohesive profession. The next time our forces will have to be even stronger and work even quicker if we hope to be as fortunate when this issue arises again," said Dr. Brookfield.

A key participant in CDA's recent national conference on third party plans, Dr. Brookfield is well aware that managed care and other proposed changes to Canada's oral care delivery system also have the potential to change the face of dentistry. The answer, he believes, is to inform patients about the true value of dental care, and to ensure that patient needs, not procedure costs, continue to be the determining factor in treatment planning.

"Third party plans are now in a state of flux and change. It's probably only natural that after 25 years of expansion these plans would start to go through a metamorphosis. But this change could ultimately benefit both our profession and our patients if we can show our patients the value of our services, and get them to accept the idea that dental care has a cost. We need to put an end to the mentality that dental plans mean free dental care.

"CDA must be in the vortex of these changes to protect our patients' health, our profession, and the sanctity of the dentist-patient relationship."

Patient health should also be the determining issue with respect to resolving the amalgam issue, Dr. Brookfield believes. In short, as long as Health Canada maintains that dental amalgam is safe, and scientific consensus supports this view, CDA will continue to defend the use of dental amalgam as an efficacious, cost-effective restorative material.

The same rationale can also be applied to the fluoride issue. CDA will continue to monitor the scientific literature, says Dr. Brookfield, to ensure that CDA's position on fluoride supplementation reflects current thinking. If it becomes clear that CDA's recommendations on the use of fluoride need to be modified, as it did in 1993, the board of governors will be asked to take appropriate action.

Other issues lurking over the horizon that Dr. Brookfield will likely have to come to grips with in 1995-96 include dental manpower and the future of dental education. CDA is currently involved in a dental human resources study to assess the long-term demand for oral health care relative to the supply of dentists, hygienists and dental assistants. In addition, CDA has established a special task force to examine the future of dental education in Canada.

But the key concern that Dr. Brookfield hopes to address in his term as CDA president is membership.

"On the positive side, membership is up in both Ontario and Quebec this year. I think the issue

"Without strong membership, we face an uncertain future.

I have been around dental politics for 20 years, and I have seen the benefits of having a unified, powerful association. Membership is everything."

of dental benefit taxation has alerted many non-members to the threats faced by our profession, and the need for a strong unified voice to carry our message to both the public and to government.

"Without strong membership, we face an uncertain future. I have been around dental politics for 20 years, and I have seen the benefits of having a unified, powerful association. Membership is everything."

Dr. Brookfield is also very aware of the benefits that come with belonging to a strong, caring family. Despite everything he has on his plate this year, he also intends to spend as much time as he can with his wife, Jane, and his five daughters: Stephanie, 23; Melissa, 20; Jennifer, 18; Katie 15; and Jessica, 12. With the three youngest children at home, and the two oldest away at university, the Brookfield home is a busy, active place.

When Dr. Brookfield isn't doing something with his family, or relaxing at his cottage — where he can usually be found either "hammering nails on some minor project, relaxing in the boat, fishing or waterskiing" — chances are you'll find him on the golf course or the baseball diamond. Unless you visit during the six months when Kirkland Lake is covered in the snow of a Northern winter. Then you'll probably find CDA's new president out skiing, or possibly lending a helping hand to a young dentist.

From taking on high school co-op students, to hiring students for the summer, to helping dental assisting students gain valuable clinical training, Dr. Brookfield has done it all, year after year.

"I very much enjoy working with new grads to help them get started in the first few years of dental practice, and to learn from their experiences. Building their confidence and helping them to become well-rounded general practitioners."

It's also part of Dr. Brookfield's commitment to organized dentistry. By helping young dentists to enter the profession successfully, and talking to them about the value of a strong national association, he hopes not only to develop future leaders, but also to ensure the continued health of his chosen profession.

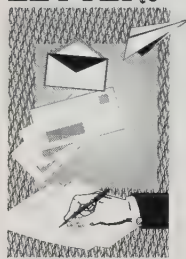
If he had to go back and do it all again, Dr. Brookfield would not hesitate to jump into the sea of dental politics.

"I have said many times that the experiences I've had, the knowledge I've gained, and the good friends I've made, far outweigh the work and inconveniences of association involvement. It's enhanced my love for my profession, and I strongly recommend it to all dentists. My involvement has also rewarded me with accelerated personal growth and self-confidence, which has helped me in areas far removed from organized dentistry — I've never had any second thoughts about my decision to participate in dental politics.

"But there have been issues that presented ominous challenges to me and our profession. I still remember the capitation wars of the 1980s, and the gut-wrenching pressure put on our ODA executive of the day to meet this challenge. We were successful. CDA, ODA and all 10 provincial associations should be proud of what we've already achieved, but we must continue to work together, and speak with a strong, unified voice."

With Dr. Jim Brookfield at the helm of CDA, ably assisted by his management team and a strong executive council, Canadian dentistry is in good hands. ■

LETTERS



Infection Control

In a series of articles in the June 1995 edition of the *Journal* (Vol. 61, No. 6), Dr. Epstein and colleagues emphasized that many currently practised infection control procedures have no scientific corroboration of their necessity.^{1,2}

Indeed, they identified one of the principles of infection control, which is that, "precautionary procedures must be based on a demonstrated risk of infectious disease transmission, and not on a theoretical risk alone." Two other principles are that: the precautionary procedures must be demonstrated to be effective in a clinical environment, and the primary purpose of infection control is the prevention of nosocomial infections.

If regulatory agencies and concerned dentists followed these simple rules, we would be spared the excessive display of unnecessary and expensive infection control paraphernalia as illustrated on the front cover of the *Journal's* June 1995 edition.

John Hardie, BDS, M.Sc., PhD, FRCD(C)

Tabuk, Saudi Arabia

1. Epstein, J.B., Mathias, R.G., and Gibson, G.B. Survey to Assess Dental Practitioner's Knowledge Of Infectious Disease. *J Can Dent Assoc* 61(6):519-525, 1995.

2. Gibson, G.B., Mathias, R.G. and Epstein, J.B. Compliance To Recommended Infection Control Procedures: Changes Over Six Years Among British Columbia Dentists. *J Can Dent Assoc* 61(6):526-532, 1995.

Infection Control

The details supplied by Dr. Weiss (Hepatitis C: What a Dentist Should

Know. *J Can Dent Assoc* 61(6):537-540, 1995) do not support his conclusions that dentists are "probably at increased risk of contracting HCV," and that dentists should "place an even greater emphasis on universal precautions."

Dr. Weiss employs antibody levels to HCV as a measure of infectivity. According to him, fewer dentists (0.97 per cent) have evidence of HCV antibodies than the general population (1.3 per cent or 1.4 per cent). These figures do not support his first conclusion. Interestingly, the author admits that in documented exposures to HCV, health care workers have a negligible risk of developing HCV antibodies, and that the level of HCV antibodies among health care workers (0.7 per cent) is also less than that of the general population.

Dienstag and Ryan¹ have proposed that dentists exposed to continuous, low intensity, occupationally derived doses of HBV, become naturally immunized against HBV and not infected by it. The same interpretation may be applied to the presence of HCV antibodies. Until properly controlled prospective studies determine the actual rate of acute symptomatic hepatitis C infection among dentists, all that should be concluded from the article by Dr. Weiss is that, compared to the general population, fewer dentists have evidence of HCV antibodies.

According to Dr. Weiss, a human bite may have transmitted HCV. This is an inoculation type injury that rubber gloves would not have prevented. Nevertheless, Dr. Weiss promotes their use, and the employment of universal precautions without establishing that: dentists occupationally acquire acute, symptomatic hepatitis C infection; and universal precautions would prevent such infections, if they did occur. It is for these reasons, that the conclusions stated by Dr. Weiss should be considered as unsubstantiated.

Hepatitis C is not a new disease, having previously been classified among the non-A non-B group of hepatic infections. It should be possible, from retrospective reviews, to determine the number of dentists

with clinically diagnosed non-A non-B hepatitis unrelated to blood transfusion, drug abuse, or hemophilia. This would provide a more reasonable assessment of the significance of hepatitis C to dentistry than the conclusions offered by Dr. Weiss.

John Hardie, BDS, M.Sc., PhD, FRCD(C)

Tabuk, Saudi Arabia

1. Dienstag, J.L. Ryan. Occupational Exposure to Hepatitis B Virus in Hospital Personnel: Infection or Immunization? *Am J Epidemiology* 115(1):26-39, 1982.

Author's Response

Dr. Hardie states that I am wrong to assess that dentists are probably at increased risk of contracting the hepatitis C virus. In the only case-control study published pertaining to HCV and dental practise, Klein¹ discovered a significantly higher risk in dentists in comparison to a control group (OR 12.9). As stated in my article, eight of 456 dentists were carrying antibodies directed against HCV, compared to only one of 723 controls. Moreover, stratified between the oral surgeons implicated in more extensive types of surgery and other dentists, the infection rate in the first group was also significantly higher (OR 10.5). It is worthwhile noting that all patients with other risk factors for HCV were excluded from this study.

Regarding the prevalence of HCV in the general population, the article by Stevens finding a prevalence of HCV of 1.4 per cent in the New York area reflects, in part, the population of New York city, where the rate of carriers is much higher than in other parts of the country. Many patients with certain risk factors were screened in this study. Moreover, it is very well established that the risk of HCV transmission through percutaneous sharp object injury is about 4.0 per cent, which although not excessively high, is 10 times higher than the risk of HIV transmission. As dentists are always working with sharp objects, they are certainly at higher risk than the general population to come into contact with HCV. By the way, others studies with control groups have proven the increased risk of exposure to

HCV in health-care providers.^{2,3,4} Molecular analysis has also proven the work-related transmission of HCV.⁵

Dr. Hardie states that "dentists exposed to low intensity, occupationally-derived doses of HBV...and not infected by it" implies a certain immunity. He gives an old reference dating from 1982 to substantiate his belief. Since then, epidemiological studies, the birth of molecular biology, the advent of liver transplantation and much improved serological testing have completely changed the understanding of HBV disease in general. Dr. Hardie's statement is totally false: there is no such thing as developing an immune response to a viral infection and not being infected by a virus.⁶ Unless you are vaccinated against HBV, the only way to be protected against the virus is to have the infection and to start producing protective antibodies (anti Hbs, anti Hbc at a lesser degree). You can either get rid of the virus in the majority of cases (90 per cent) or become a chronic carrier. You can, however, boost your immune response if you get in contact with the virus, but only in cases where you already have had the infection. Besides, by contrast to hepatitis B, the rate of chronic carriage in HCV-infected people reaches 50 per cent.

Dr. Hardie does not seem to promote the use of gloves. In experimental models, it was shown that gloves decrease the amount of blood transferred and reduce the inoculum size of infectious agents.⁷ Knowing that any infection is inoculum dependent, gloves certainly reduce the risk of acquiring an infectious agent. Universal precautions are proven actions, barriers and behaviors aimed at decreasing the transmission not only of HCV, but also of HBV, HIV, HTLV-1 and 2, herpes viruses 1 and 2, cytomegalovirus and other known or unknown blood-borne pathogens.^{8,9} The fact that we are seeing less and less infections in health care providers today is only a reflection of the implementation of these procedures. Not strictly adhering to universal precautions would only be detrimental to dental practise in general. In 1995, in North America, it would be labelled malpractice.

Hepatitis C is only symptomatic in about 15-20 per cent of cases, so it would be difficult to determine the prevalence of the infection solely on clinical grounds. Moreover, about half of the infected patients will get rid of the virus. Unlike HBV, available HCV markers (anti-HCV) are not present in ancient cases. It is thus possible that a certain percentage of health professionals had the infection but are not sick any more.

Finally, Dr. Hardie states that hepatitis C and non-A, non-B hepatitis are the same. Although a majority of non-A, non-B hepatitis represents hepatitis C, new viruses called hepatitis F and G are being discovered, which puts an even greater emphasis on the recognized, proven and efficient infection control recommendations issued by the CDC.⁹

K. Weiss, MD, CSPQ, FRCD(C)
University of Montréal

1. Klein, R.S. et al. Occupational risk for hepatitis C virus infection among New York city dentists. *Lancet* 338:1539-1542, 1991.
2. Jochen, A.B. Occupationally acquired hepatitis C virus infection. *Lancet* 339(8788):304, 1992.
3. Polish, L.B. et al. Risk factors for hepatitis C virus infection among health care personnel in a community hospital. *Am J Infect Control* 21:196-199, 1993.
4. Gerberding, J.L. Incidence and prevalence of HIV, HBV, HCV and CMV among health care personnel at risk for blood exposure: final report from a longitudinal study. *J Infect Dis* 170:1410-1417, 1994.
5. Confirmation of HCV virus transmission through needle-stick accidents by molecular evolutionary analysis. *J Infect Dis* 170:1575-1578, 1994.
6. Robinson, W.S. Hepatitis B virus. In: Mandell G.E. et al, *Principles and practice of infectious diseases*. Chapter 124, pages 1406-1439, 1994.
7. Mast, S.T. et al. Efficacy of gloves in reducing blood volumes transferred during simulated needle-stick injury. *J Infect Dis* 168:1589-1592, 1993.
8. Klein, R.S. Universal precautions for preventing occupational exposures to HIV type 1. *Am J Med* 90:141-44, 1991.
9. Centers for disease control. Recommended infection-control practices for dentistry. *MMWR*, 42(RR-8):1-12, 1993.

Uncommon Postoperative Temporomandibular Joint Complications

I read with great interest the article "Uncommon Postoperative

Temporomandibular Joint Complications" (Weinberg, S. et al. *J Can Dent Assoc* 61(5):403-409, 1995).

As a general dentist with a special interest in the so-called TMJ disorders (and 30 years experience in treating them), perhaps I might be permitted a few comments.

First, the narrow focus on the joint itself seems to be a part of the problem. The craniomandibular articulation consists of two TMJ's and the articulation of the teeth. High school physics tells us that anything that effects one foot of a tripod can not fail to affect the other two. Obviously, the joint does not become pathologic by itself. The cause is often found in an abnormal relationship between the mandible and the rest of the skull, inborn or acquired. Surgical correction of intra-articular derangements without addressing the malrelation of the two bones not only frequently yields disappointing results, but makes correction of the abnormality much more difficult.

The myofascial pain described in Case 1 demonstrates this point. The malrelation of mandible to cranium produced muscular stress which was the grounds of the myofascial symptoms. Possibly, if these had been investigated and adequately treated in timely fashion, the recurrences which led to the series of surgical interventions might have been avoided. If the neuromuscular part of the problem had been addressed before the first surgery, perhaps the result would have been sustainable. The fact that the patient still suffers myofascial pain suggests that the underlying abnormality is still present. If so, there is reason to anticipate yet another failure.

Case 2 suggests another line of speculation. To what degree was the condition for which the mandibular advancement was done a true skeletal disorder and to what extent was it functional? Was there an unrecognized vertical component to that abnormality? The authors recognize that there was "excessive distalization" of the condyles. Why were the condyles forcefully seated posteriorly, when clearly the normal muscle pull is anterior, and the nerves and vessel that supply the joint are mainly in the posterior bilaminar portion of the articular disc? Further, it seems reasonable to conclude that

if the condyles are forced posteriorly, then the condyles, not the discs, are displaced. The abnormality in their relative positions does not require anterior displacement of the discs, nor does there seem to be any reason to infer that the condylar position pushed the discs out of place.

Obviously, this case was originally seen as a cosmetic operation, and the effects on the TMJ's were neither foreseen nor intended. Still, consideration of the neuromuscular requirements might have saved trouble for both the patient and the surgeon. If, for example, the retrognathic appearance, which I take to be the reason for surgery in the first place, was partly functional, then working from the existing occlusion had to result in posterior displacement of the condyles, even if they had not been forcibly retruded. It might also have been useful to know what component of the interincisal distance is vertical and what posterior. Again, the neuromuscular factor has been ignored.

Case 3 again illustrates the error of focusing exclusively on the joint. Meniscectomy was done, I take it, because the disc was displaced and severely damaged. This did not happen by itself. The cause most probably lay in an abnormal relation between mandible and cranium, which appears not to have been addressed at all. Thus the effect was treated, the cause ignored. Again, failure was predictable, though it usually takes a little longer than nine months.

To summarize, three cases are presented in which surgery was performed according to established norms, which do not take into account the fact that there are three parts to the craniomandibular articulation and that what happens to any one of these parts affects the others. Neuromuscular factors were not considered in any of the three. There may be cases in which these factors can safely be ignored, but that is a postoperative diagnosis. I could add many other cases to these, of patients that I have treated conservatively after failure of surgery. They have been among the most difficult to manage. I could speculate as to possible causes, including scar tissue formation limiting movement, and structural altera-

tion that makes muscle accommodation difficult — but so can anybody else, so this is not helpful. What would be useful is recognition of the tripartite nature of the craniomandibular articulation and of the neuromuscular factors involved.

*Ray Mulrooney, DDS, B.Sc.D.
Scarborough, Ont.*

Author's Response

I thank Dr. Mulrooney for his interest in the article entitled "Uncommon Postoperative Temporomandibular Joint Complications" and for sharing his comments. He might, however, have omitted the rather pedantic revelation, "The craniomandibular articulation consists of two TMJ's and the articulation of the teeth . . . anything that effects one foot of a tripod can not fail to affect the other two," as I and other astute readers of the *Journal* have been aware of these facts since second-year dental school.

Apparently Dr. Mulrooney places considerable emphasis on the craniomandibular relationship as a major cause of TMJ problems. While an abnormal relationship between the mandible and the rest of the skull may be a contributing factor to TMJ pain dysfunction, it is well known that the cause of this condition is multifactorial, and much remains to be learned about its specific etiology and pathogenesis.

I offer the following comments in response to his observations.

Case 1

Dr. Mulrooney makes certain "assumptions" concerning the past history and treatment that are purely hypothetical and conjectural, rather than factual, e.g. "The myofascial pain described in Case 1 demonstrates this point . . . If the neuromuscular part of the problem had been addressed before the first surgery, perhaps the result would have been sustainable."

It is not known whether the mandible was malrelated to the cranial base and whether this resulted in muscle stress and subsequent myospasm, nor is it known whether the patient's past symptoms were inadequately investigated or treated in an untimely fashion, or that the neuromuscular component of the problem was not properly ad-

dressed. This is pure conjecture and clearly had no direct bearing on the patient's presenting symptoms or the treatment described. Dr. Mulrooney notes that "the fact that the patient still suffers myofascial pain suggests that the underlying abnormality is still present". Surely Dr. Mulrooney is not suggesting that the only cause of myofascial pain is the result of craniomandibular malrelation.

Case 2

Dr. Mulrooney asks "To what degree was the condition for which the mandibular advancement was done a true skeletal disorder and to what extent was it functional?" The answer to this question is not known with certainty. However, in common practise surgical treatment is reserved for skeletal disorders, as most functional disorders can be managed non-surgically (e.g. orthodontics).

"Was there an unrecognized vertical component to the abnormality?" The answer to this question is unknown.

Dr. Mulrooney continues: "The authors recognize that there was excessive distalization of the condyles." As the authors were not the surgeons in this case, I can only speculate that the surgeon involved was concerned about skeletal relapse following mandibular advancement and that, in order to minimize the risk of relapse, the condylar segments were positioned forcefully in a postero-superior direction in the fossae to prevent them from passively slipping anteriorly against the posterior slope of the articular eminences from which they often recede, resulting in early mandibular relapse.

Dr. Mulrooney continues: "Further it seems reasonable to conclude that if the condyles are forced posteriorly, then the condyles not the discs are displaced." He should carefully reread the discussion of this case where this condition is clearly explained. However, to review it briefly, if the condyles are forced posteriorly, the discs may undergo relative or absolute anterior displacement or they may remain normally related to the condyles but excessively compressed. Absolute

... Continued on page 809

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SELF-LEARNING / SELF-ASSESSMENT

The SLSA Program is published as a monthly feature in the *Journal of the Canadian Dental Association* as a resource for dentists wishing to enhance their dental knowledge and expertise. It is intended solely as a vehicle for self-learning and self-assessment. Beginning this month, the program will present a series of 20 questions, answers, rationales, references, reversal questions, and reversal answers, followed by an annual 15-question quiz. The 1995-96 quiz will appear in the June 1996 issue of the *Journal*. Answers to the quiz will be published in the August 1996 issue. Dentists who complete the quiz may be eligible to receive continuing education points, and their names will be forwarded to their provincial licensing bodies for consideration.

QUESTION 1

In the preparation of a Class II cavity in a mandibular molar for an amalgam restoration you find that caries is deep and has destroyed the pulpal axial line angle. You would place a:

- A. liner of calcium hydroxide to stimulate reparative dentin.
- B. base to give thermal insulation.
- C. base to restore the axial line angle.
- D. base to re-establish a flat floor for amalgam condensation, strength, and longevity.
- E. All of the above.
- F. None of the above.

QUESTION 2

When a posterior composite resin restoration has a sealant applied to it, the restoration over time will show:

- (1) more occlusal wear.
 - (2) less occlusal wear.
 - (3) improved marginal integrity.
 - (4) less staining of the margins.
 - (5) more bacterial penetration.
- A. (1) (3) and (5)
 - B. (2) (3) and (5)
 - C. (2) (3) and (4)
 - D. (1) (4) and (5)

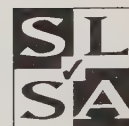
QUESTION 3

Which of the following characteristics of cut dentin will affect local adhesion in dentin bonding restorative materials?

- (1) Smear layer.
 - (2) Tubule density.
 - (3) Tubule length and size.
 - (4) Degree of sclerosis.
- A. (1) only.
 - B. (2) and (3)
 - C. (2) (3) and (4)
 - D. All of the above.

CDA encourages Canadian dental licensing authorities to recognize the SLSA Program as an appropriate and acceptable resource for dentists seeking to earn the continuing education credits required for the maintenance of licensure.

Currently, all 10 provincial licensing bodies — British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland — recognize the SLSA program for continuing education credits.



QUESTION 4

Crowding of mandibular anterior teeth is progressive and continues until:

- A. eruption of the third molars.
- B. age 25-30.
- C. age 30-40.
- D. age 40-50.
- E. age 50 and beyond.

QUESTION 5

Ultrasonic bacterial debridement is a periodontal treatment which uses:

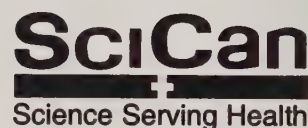
- (1) surgical curettage.
- (2) pocket irrigation.
- (3) antimicrobial agents.

- A. (1) and (2)
- B. (2) and (3)
- C. (2) only
- D. All of the above.
- E. None of the above.

(Answers to these five questions will appear in next month's *Journal*.)

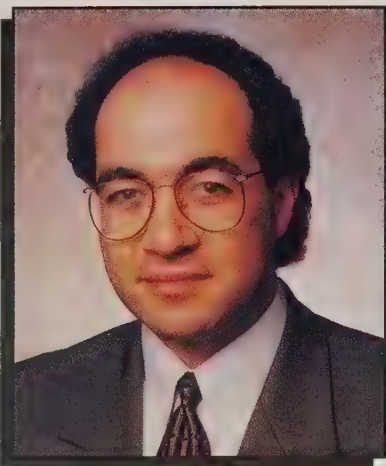
The SLSA Program is a resource and service, directed to the dental profession and the licensing authorities, which is intended to help dentists achieve and maintain the high levels of expertise and competence identified by Canadian dental licensing authorities. All questions and other material are based on current, referenced literature. Financial support for the program has been provided by A-dec, Colgate, the Fowler-Pearce Partnership (Nesbitt Burns), Nobelpharma, and Sci-Can. Copyright© 1995, the SLSA Corporation. All rights reserved. No portion of the SLSA program may be reprinted, copied or reproduced in any manner without the permission of the SLSA Corporation. The views expressed in the questions, answers, rationales, reversal questions and reversal answers of the SLSA program are not necessarily those of the Canadian Dental Association or its related organizations.

Funding for the SLSA Program has been provided by:



NEWS UPDATE

The Montreal Dental Club Names New Executive



Dr. Sam Sgro

The Montreal Dental Club, founded in 1897, and one of the oldest dental study clubs in Canada, has named its new executive for the 1995-1996 session.

Dr. Sam Sgro will serve as president, and will be joined on the club's executive by Dr. Gerard Weinlander, past-president; Dr. Mike Percio, president-elect; Dr. Frank A. Kay, treasurer; Dr. Petra Dando, secretary; and Dr. Leo Moran, historian-archivist.

Serving as directors are: Drs. Jean-Pierre Bedirian, Lesley David, Sirius Homyun, Tom Karamitsos, Oleg Kopytov, Johanna Pham, Bryan Tremblay and Evangelia Valavanis. ■

ACAAI Issues Latex Allergy Statement

The American College of Allergy, Asthma and Immunology (ACAAI) is calling for major changes in patient care practices, occupational health guidelines and government regulations "to protect patients and health-care workers at risk of developing potentially life-threatening latex allergy."

ACAAI has released a position statement that calls for a five-pronged approach to help prevent

severe reactions in latex-sensitive individuals and reduce the growing incidence of latex allergy.

The statement, "Latex Allergy — An Emerging Health Care Problem," suggests that latex allergy has become a major occupational health problem in the U.S. over the last five years, with more than 100,000 exposed health-care workers at risk for latex reactions.

"Latex allergy is a serious, increasingly widespread, but largely unrecognized health care problem," said Dr. Lauren Charous, the chairman of ACAAI's latex hypersensitivity committee. "Its prevalence in certain high-risk groups has reached epidemic proportions."

In a July 18 press release, ACAAI said that latex allergy develops most commonly in people who have a history of frequent or intimate exposure. At high risk are those who have had frequent surgical procedures, particularly in infancy, and workers with occupational exposure, especially to latex gloves. A history of allergies or "hay fever" also may be a significant risk factor.

ACAAI is currently recommending immediate implementation of proposed American Food and Drug Administration regulations that would require "medical device

content labelling for natural rubber latex and ban the misleading "hypoallergenic" labelling now permitted on some latex gloves" in the United States.

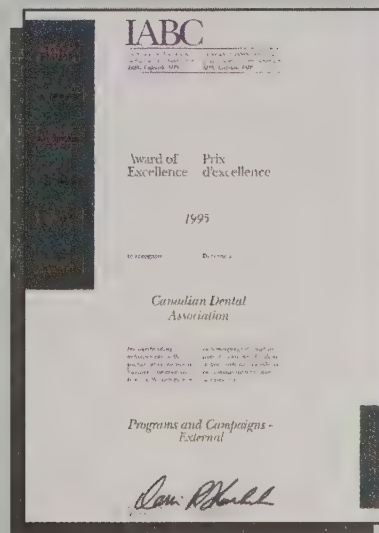
In addition, ACAAI is recommending the adoption of its five-pronged approach to reduce the risk of latex allergy:

- Require latex content labelling of consumer goods over the next one to two years;
- Improve and speed diagnosis of latex allergy by creating a "fast-track" evaluation process for skin-prick testing;
- Fund studies to help identify the causes of latex allergy and minimize risk factors contributing to this growing health problem;
- Provide a safe environment for allergic workers. Use only low-allergen gloves to reduce the amount of latex allergen released into the air. Create "safe zones" where only non-powdered latex and non-latex gloves and medical devices are used, as necessary, to protect highly sensitive workers;
- Mandate maximum levels of extractable allergen in latex gloves.

"Enough is Enough" Campaign Wins Prestigious Award

CDA's "Enough is Enough" campaign against the taxation of employer-paid dental plan premiums has won an Award of Excellence from the International Association of Business Communications (Ottawa Chapter).

Held annually, the IABC Excel Awards competition recognizes outstanding achievement in organizational communication. CDA's Enough is Enough campaign won the award of excellence in the Investor/Customer Relations category, Division I, Programs and Campaigns — External. ■



CDA's "Enough is Enough" campaign recently won an Award of Excellence in the IABC Excel Awards competition.

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CDA adopted "Guidelines On the Use of Latex in Dentistry" in 1994. The guidelines state that:

Latex is most commonly used in dentistry in latex gloves and dental dams.

1. Dental patients should be asked if they have allergies. If they do, ask them if they have ever had a reaction to a balloon or rubber gloves.
2. Use non-latex products on patients who say they have reacted to rubber or latex products. Special attention should be given to patients at increased risk due to chronic latex exposure including spina bifida patients, paraplegics and quadriplegics. Medical non-latex gloves are available in vinyl and hydrocarbon polymer. Consult product labelling.
3. Following latex exposure, if a dental worker shows skin problems, the worker should be tested for latex allergy by a medically qualified allergist. ■

Ash Temple and Dentech To Merge

Ash Temple Limited and Dentech Products Limited have reached an agreement under which Ash Temple will become a majority shareholder in Dentech, a manufacturer of dental operator equipment based in Washington State and Clearbrook, British Columbia.

Mr. Michel Hart, chairman and CEO of Ash Temple, said that the merger will allow the 100-year-old Ash Temple to augment its line of high-quality products for the dental profession.

Currently Ash Temple operates 14 dental distribution branches across Canada as well as A-Tech Inc., its cabinet manufacturing unit; Microbex Aseptics Inc., its infection control products manufacturing unit; and ATP Industries Inc., which manufactures the Prosthoflex System for full and partial dentures. ■

CAOP Releases Toluidine Blue Statement

In response to numerous inquiries from concerned dentists, the Canadian Academy of Oral Pathology (CAOP) has issued a statement on the use of toluidine blue in the clinical assessment of premalignant and malignant oral lesions. According to the statement:

"Toluidine blue is a dye which stains various acidic tissue components, including those containing relatively high amounts of nucleic acids (DNA and RNA). The staining of cancerous lesions by mouth rinses containing toluidine blue is a phenomenon that has been known for more than 30 years. A commercial product containing one per cent toluidine blue as an active ingredient (OraScan) has been promoted recently in Canada as a screening agent in the diagnosis of oral cancer.

"A review of the literature on the subject and personal experience of Canadian oral pathologists indicate

Racing Dentist Makes Pit Stop At Toronto Hospital

Dr. Jack Miller had more than Indy car racing on his mind last July when he arrived in Toronto to compete in an Indy Lights race.

The world's only professional "racing dentist," Dr. Miller was also thinking about the kids he'd see when he and the mobile Teledyne Water Pik dental clinic made a pre-race pit stop at the Toronto Hospital for Sick Children.

At the hospital, Dr. Miller took several children on a tour of the clinic, signed autographs, and provided free dental advice in front of his car.

A practising dentist from Indianapolis and a professional Indy Lights race driver, Dr. Miller ended his Toronto visit by driving the number 61 Teledyne's Indy Lights car to a 15th-place finish.

"Since the dental clinic travels with a show car that looks exactly like my race car, it helps children who might otherwise have been



Dr. Jack Miller brings his car, and the Teledyne mobile dental clinic, to the Toronto Hospital For Sick Children.

apprehensive about a trip to the dentist to forget their anxieties," said Dr. Miller.

Local dental volunteers man the dental clinic during Dr.

Miller's races, providing free dental screenings to help both children and parents realize the importance of the early prevention of tooth decay. ■

that use of this dye by inexperienced persons can result in many false positive results as the dye may be retained by non-cancerous inflamed or ulcerated tissues and by surface debris. Dye retention in epithelial dysplasia is unreliable. False negative results may be obtained due to poor dye penetration of keratotic cancers. As the incidence of oral cancer in the Canadian population is low, the screening of asymptomatic patients is unwarranted.

"Both false positive and false negative results can have damaging consequences to the patient.

"Toluidine blue has been shown to be mutagenic in bacteria and animal studies suggest that it may possibly have oncogenic activity when associated with herpes simplex virus infection.

"All lesions of the mouth suspected by the clinician as being malignant or pre-malignant should be investigated by incisional biopsy which is the only unequivocal investigation method."

Based on its investigations, CAOP has put forward the following two recommendations:

1. The use of toluidine blue for screening for oral cancer is not recommended.
2. Lesions suspected clinically of being malignant or pre-malignant should be investigated by prompt incisional biopsy regardless of staining reaction to toluidine blue. ■

The Charm Of a Deed Is Its Doing

An Ontario dentist has discovered that although the charm of a good deed is the act itself, its reward can turn up half way around the world.

The deed in question occurred when a South African tourist with a loose crown made an emergency visit to a Richmond Hill dental office. In a gesture of good will, the dentist efficiently cemented the crown into place and no fee was charged. The patient was so impressed with the dentist's actions that she not only wrote to the Dental Association of South Africa on her return home, but also made a generous donation to its benevolent fund in the name of the Ontario dentist. ■

WHAT'S IT?

The "What's It?" column is once again grateful to Dr. William Larder of Halifax, Nova Scotia, for supplying us with a mystery item that needs some identification. The instrument in question is believed to have come from an old dental office, and has a sliding graduated pointer that can be locked into position. It

would seem to be some sort of measuring device or depth gauge.

Any reader who can help Dr. Larder identify the instrument is asked to write to Dr. P. Ralph Crawford, Editor, *Journal of the Canadian Dental Association*, 1815 Alta Vista Drive, Ottawa, Ont. K1G 3Y6. ■



The Oral Care Report

Beginning this month, Colgate's *Oral Care Report* will be distributed with the *CDA Journal* as a polybag insert.

Edited by Dr. Gordon Nikiforuk, dean emeritus of the University of Toronto dental faculty, *Oral Care Report* was previously mailed as a separate piece.

Now in its fifth year of publication, the quarterly newsletter is well respected in the dental community, and has become a popular forum for dental professionals. ■

Oral Cancer and Two American Presidents

The July 1995 issue of the *Journal of the Royal Society of Medicine* carried an interesting account of two American presidents — Ulysses S. Grant and S. Grover Cleveland — who suffered from oral cancer.

According to the article,¹ in early June 1884, seven years after leaving

office as president of the United States, General Grant complained of a sore throat.

A very stubborn man, Grant, then 62, delayed seeking treatment for many months. After considerable persuasion, however, the former president was ultimately examined by Dr. John Hancock Douglas, regarded as a throat specialist, who described a lesion of the right tonsillar fossa "of serious epithelial trouble" together with a neck node.

Grant, a heavy smoker and for at least part of his career a heavy drinker, was advised to give up tobacco use. The tonsillar lesion was initially treated by "local treatment of topical iodoform, salt water gargles, dilute carbolic acid gargle, gargles composed of permanganate of potash and yeast, and four per cent topical cocaine for the relief of pain."

In February 1885, a biopsy of the lesion was taken by a New York surgeon. From the description and drawings made at the time, by to-

day's standards it would be considered a squamous cell carcinoma. The surgical removal of the tumor was considered to be mechanically possible, but the procedure did not offer a guarantee of complete removal, and there was a risk to Grant's life from severe shock.

It is reported that Grant was quite aware of the natural course of the growth, and in his latter days he took to spending his days and nights in a sitting position for fear of suddenly choking to death in his sleep. He died on July 23, 1885, about a year after first perceiving a soreness in his throat.

President Grover Cleveland, shortly after his inauguration for a second term of office in May 1893, at the age of 56 years, sought advice from his White House physician about a soreness on the roof of his mouth. On examination, the physician noted an angry ulceration with crater-like edges and a peculiar granulated surface. The initial biopsy noted that while there was no proof of malignancy, the specimens suggested epithelioma.

Unfortunately, 1889 was a period of great economic unrest, and the world monetary system, then based on the Gold Standard, was in a perilous state. As it was believed that economic chaos could result if anything untoward happened to the President of the United States, it was decided that President Cleveland would only receive medical treatment under the greatest of secrecy.

On the evening of June 30, 1893, the president and his surgical team slipped quietly aboard a yacht belonging to a close friend of the Cleverlands. The entire team, including a New York dentist, Dr. Ferdinand Hasbrouck, had sworn under oath not to reveal any details of the procedure. In fact, it remained a secret for 20 years, at which time it was revealed the president had undergone an intraoral partial maxillectomy for the removal of the tumor — a gelatinous mass thought to be a sarcoma.

The operation lasted 1.5 hours, after which the wound was packed with iodoform gauze. Five days later, President Cleveland left the

yacht. Reporters were told that he had caught a cold and was suffering from a toothache.

A few weeks later, President Cleveland was fitted with a vulcanized rubber maxillary obturator that brought his speech back to normal. He went on to serve his full term in office, with no recurrence of the tumor, and died on June 24, 1908, from heart failure complicated by pulmonary thrombosis and edema. ■

— *P. Ralph Crawford, BA, DMD*

1. Renehan, A. and Lowry, C. The oral tumours of two American Presidents: what if they were alive today? *J Royal Soc Med* 88:377-383, 1995.

U.S. National Dental Museum To Open In 1996

The Dr. Samuel D. Harris National Museum of Dentistry will open April 23, 1996, in Baltimore — on the same day its founder and namesake celebrates his 93rd birthday.

Dr. Harris, a retired pediatric dentist from Detroit, contributed the first \$1 million to the project in June 1992. He wants the museum to emphasize and promote dental education, prevention and early care.

To date there are about 40,000 dental artifacts in the museum's collection. ■

WHO and FDI Sign Cooperation Agreement

The World Health Organization and the FDI World Dental Federation have signed an "agreed plan for cooperation" in the interests of improving oral health around the world.

Under the terms of the agreement, the two groups will cooperate to:

- 1) Improve health and oral-health care in developing countries;
- 2) Improve and maintain health and oral-health care in the industrialized countries;
- 3) Promote a wider vocational role for the dental profession, consistent with overall health protection and promotion through oral health;
- 4) Develop global and multinational activities on specific topics agreed on between the parties in individual cases;
- 5) Develop technical collaboration through joint working groups and meetings of oral-health officers.

In addition, representatives from FDI and WHO will meet together on an annual basis, and each organization will be able to send a representative to the other's annual assembly meetings, and "to address the assemblies in accordance with the applicable principles and rules of procedure." ■



Representatives of FDI and WHO sign the "agreed plan for cooperation."

LIBRARY PACKAGE



The Library Package for September is **BRUXISM**. This package contains more than 20 dental articles and can be ordered by calling the CDA Library at 1-800-267-6354 extension 223. In addition to this month's package, the library publishes over 95 other packages on various dental topics. When ordering a package be sure to request a complete list of the packages currently available. Each package is available to CDA members for a cost of \$5, plus applicable taxes.

New Acquisitions

Hoffmann-Axthelm, W. *History of dentistry*. Quintessence, 1981.

Lipp, M.D. *Local anesthesia in dentistry*. [video, appx. 45min & text] Quintessence, 1993.

Manitoba Dental Association. *Open wide: an interpersonal skills video*. Winnipeg, 1995. [library has 2 copies]

Muia, P.J. *Esthetic restorations: improved dentist-laboratory communication*. Quintessence, 1993.

Reid, J.S., Callis, P.D. and Patterson, C.J. *Rubber dam in clinical practice*. Quintessence, 1990.

Stockdale, C.R. *Endodontic surgery*. Quintessence, 1992.

Tetsch, P. *Basics of dental implantology*. Quintessence, 1993. [55 min.]

Wise, M.D. *Failure in the restored dentition: management and treatment*. Quintessence, 1995.

CDA MUSEUM donations requested

Memorabilia from CDA's 92-year history is now on display in antique cases in the library of the Canadian Dental Association headquarters in Ottawa.

As originally planned, the displays are changed on a regular basis to suitably depict different eras of our rich dental history. Donations of museum-quality dental artifacts are still being accepted and are very much appreciated. Particularly requested are larger items such as chairs, units, cabinets and X-ray machines, plus historical photos and records.

Also of interest to dental historians are the items highlighted in the column entitled "What's it?" which appears monthly in the *Journal*. This column elicits the help of readers in identifying some of the antique items presently on location in the museum.

For further information, contact Dr. Ralph Crawford at the Canadian Dental Association, 1815 Alta Vista Drive, Ottawa, Ontario, K1G 3Y6. (613) 523-1770, or call toll-free 1-800-267-6354.

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CAUTIONS: Keep out of reach of children. Do not swallow. Not to be used by children under 12 years of age. In case of accidental ingestion, contact a Poison Control Centre or doctor immediately.

DOSAGE: Rinse full strength with 20 mL for 30 seconds twice a day.

MEDICINAL INGREDIENTS: Eucalyptol 0.091% w/v, Thymol 0.063% w/v, Menthol 0.042% w/v.

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LISTERINE FIGHTS GINGIVITIS
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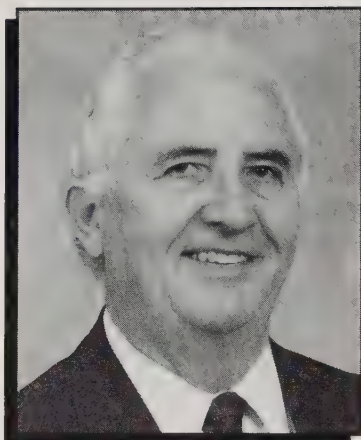
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Office Overhead Expense Insurance: Understanding The Sometimes "Misunderstood" Plan

Dr. James Wright, President of CDSPI

By definition, the concept of office overhead expense insurance seems clear enough. Simply put, this plan covers the cost of specific office expenses if you suffer an illness or injury that keeps you from working.

But where and how this plan fits into your global insurance coverage is less clear. Most dentists plan their insurance program in terms of personal insurance and practice insurance. In which category does this plan belong? It seems like personal insurance because benefits are triggered by a disability, but since it covers office expenses you could just as easily call it practice coverage.

Answering the question "Is office overhead expense coverage personal insurance or practice insurance?" depends on your point of view. If you label all plans that protect your financial security in the event of ill health "personal insurance," then this plan is personal. If you label all plans that cover practice costs "practice insurance," then it's practice.

Of course, there's nothing wrong with calling it both. It's similar to the situation when a dentist in a partnership takes out life insurance on his or her partner — is that personal insurance

or practice? If you divide your plans under personal and practice when you plan your insurance program, then list office overhead expense insurance under the category that makes the most sense to you.

Keep in mind, however, that the premium for this plan is a legitimate business expense. For example, when you're listing the overhead costs that are payable under office overhead expense insurance, you should include the premiums for this plan.

Another potential source of confusion is the difference between office overhead expense insurance and practice interruption insurance. The problem stems from the fact that both plans cover office expenses (though practice interruption also covers lost income). However, the difference between these two plans is huge, and it's based on the situation that triggers the benefit. Office overhead expense insurance is triggered by a personal disability. Practice interruption insurance is triggered by a situation affecting your office that prevents you from using it, such as fire damage that shuts down your practice. These plans protect against different risks and you need them both.

Is Your Coverage Sufficient?

Office overhead expense insurance is vitally important for two reasons. First, the probability that any one dentist will have to make a claim at some point is high. Last year, about one in 20 dentists who participated in the Canadian Dentists' Insurance Program office overhead expense plan made a claim. Statistics for the general population reinforce the probability: nearly one third of Canadians between the ages of 35 and 65 will suffer a disability that prevents them from working for at least six months.

Secondly, this plan is important because overhead expenses are usually significant. Just think about how much you pay in overhead each month. The 1994 claims under the Canadian Dentists' Insurance Program resulted in more than \$1.7 million being paid from the office overhead expense plan to Canadian dentists. All these numbers underline the importance of this plan. If you are responsible for practice costs and you don't have office overhead expense insurance, you should consider it. If you do have it, make sure your coverage is sufficient.

TRANSITIONS

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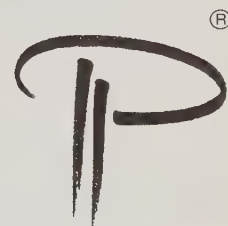
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Remember, you're buying this coverage to protect yourself in the event of a disability. When you have a disability your prime focus is your health. You don't want to be worrying about whether enough money is coming in to cover office expenses. That's why it's vital that you make sure you're not under-insured. Cover yourself for everything: salaries and staff benefits, utilities, office maintenance, laundry, rent or mortgage payments, loan interest, depreciation, rental costs, accounting and legal fees, practice insurance premiums, membership dues, business taxes, telephone, answering service, pager — and many other office expenses.

Of course, you don't want to be over-insured either. That's unlikely to happen with office overhead expense insurance from the Canadian Dentists' Insurance Program. With other plans you can end up over-insured because you will only receive a fixed monthly benefit amount. That may be fine for most professions, but in dentistry we have certain overhead expenses that decrease over time during a disability. For instance, you may have reduced payroll costs because a staff member's hours have been cut back or a staff member has been laid off. This plan allows for such reductions by enabling you to cover costs that decrease with a monthly benefit amount that also

reduces over time. (Of course you can still cover fixed expenses with a fixed monthly benefit amount.) The reducing monthly benefits save you money on the premium, which is much better than over-insuring. It's a feature you're not likely to find anywhere else.

You'll also find that the Canadian Dentists' Insurance Program plan has very competitive rates. That's partly due to a maximum benefit period of 12 months. Sometimes agents will try to sell dentists a more expensive plan with a longer benefit period — often 18 months. However, experience shows that by the time 12 months have passed, a dentist who remains

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Aggressive Equity	1.7%	9.8%	n/a		n/a		n/a	
Common Stock	9.4%	11.2%	12.3%	12.4%	✓ 9.7%	8.8%	✓ 10.0%	8.4%
Balanced	✓ 12.4%	10.8%	8.3%	9.2%	9.4%	9.4%	✓ 9.4%	8.4%
Bond & Mortgage	✓ 12.5%	10.9%	✓ 6.7%	5.4%	✓ 10.7%	9.8%	✓ 10.2%	9.8%
Money Market	✓ 6.5%	5.8%	✓ 5.5%	4.9%	✓ 7.1%	6.6%	✓ 8.4%	8.0%
International Equity	✓ 11.7%	3.6%	n/a		n/a		n/a	
European	✓ 28.6%	10.2%	n/a		n/a		n/a	
Pacific Basin	✓ 4.1%	-4.0%	n/a		n/a		n/a	
Emerging Markets	✓ -7.0%	-13.3%	n/a		n/a		n/a	

[†] CDA figures indicate annual compound rate of return with all fees deducted. The figures are historic rates based on past performance and are not necessarily indicative of future performance.

* Comparison performance figures are Globe and Mail averages for the range of similar funds offered in the marketplace before sales charges, as published in the August 17, 1995 issue.

For current unit values and GIC rates call CDSPI toll-free at: 1-800-561-9401, ext. 525.
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disabled either has an associate keeping the practice busy or has sold the practice, depending on the nature of the disability. Again, you don't want to be paying for insurance you don't need — and you won't be, with a plan that's designed specifically for dentists.

Returning to the theme of understanding this plan, there's one particular feature that many dentists are unaware of — payments for partial disabilities. As is the case with long-term disability insurance, if you suffer a sickness or injury that results in a loss of at least 15 per cent of earned income, you may qualify for prorated benefits. The disability must last longer than your elimination period, and you must be under a physician's care.

I hope office overhead expense insurance is clearer to you now. If I could leave you with one final thought, I would say make sure you have sufficient coverage. That's probably the most common mistake dentists make with this plan. Perhaps some dentists think they'll use part of their long-term disability benefits for their office, not realizing that they'll need every dollar of those benefits just to maintain their standard of living. Whatever the rationale, there's no reason to be underinsured, or you'll pay the price when you can't practise. Make sure you cover *all* ongoing office expenses. Follow that rule and you'll gain full protection and peace of mind. ■



CDSPI

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Application forms and further details about the course and its objectives may be obtained from:

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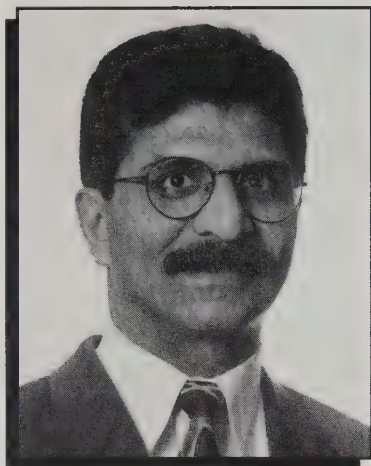
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Creating Value for Your Patients

Imtiaz Manji, B.Sc.

Principal of ExperDent

When Finance Minister Paul Martin released his budget last February, dentists breathed a sigh of relief. The profession had evaded the minister's axe, putting the looming prospect of a dental benefits tax to rest — at least for the moment.

You've probably noticed that CDA hasn't dropped the ball on this issue. The *Journal* and *Communiqué* are still publicizing the threat posed by the taxation of dental benefits, and for a very good reason. Organized dentistry and many individual dentists across the country recognize that the profession isn't untouchable. As long as there are budgets, the potential for taxing dental plan premiums exists. This is dentistry's reality check.

Although I urge you to participate in CDA's ongoing campaign against the taxation of employer-sponsored dental plan premiums — you can consult CDA for more details on how to get involved — you should also be repositioning your dental practice to thrive, with or without the presence of our present dental insurance schemes.

Motivated by Health, Not Insurance Coverage

I happen to be someone who sees the silver lining in otherwise dark clouds, the type of person

who sees a glass that is half full rather than half empty. And because of this optimism, I believe that the threat of a dental benefits tax can be viewed as an opportunity and a challenge, rather than as an imminent hardship. This isn't to say that I don't recognize the potential negative implications of such a tax — and I certainly hope that it never comes into being — but the threat they pose has actually produced some good. For one thing, it's captured the attention of dentists across the country and motivated them to act.

But in addition to letter writing and their other lobbying efforts, dentists have to prepare themselves for any eventuality. We simply do not know what will happen with respect to the taxation of dental benefits. In this climate of uncertainty, it's useful to do some soul searching. Ask yourself how your practice would fare in a completely altered system, one in which insurance was gradually squeezed out of the equation. If the thought gets your blood pressure rising, you've got some work to do.

The downside of insurance schemes is that many dentists have become dependent on them, seeing them as the cornerstone of a successful practice. (For salient evidence of this, you

need only consider the panic that sets in among dentists practising in small, industrial towns when the local plant announces major layoffs.) This dependency on insurance is dangerous, not only because of the potential for dramatic changes in the structure of third-party payment plans, but also because it places undue linkage between benefit plans and dentistry. In doing so, it undermines the real value of the profession and its role in maintaining the overall health of the population.

Some dentists have become too complacent and passive in conveying the oral health message to patients. As a result, patients don't necessarily see value in dentistry, but may view it as nothing more than a component of their benefit plan that they can take advantage of for as long as their benefits endure. If benefits stop, then so does the "bonus" of going to the dentist.

It Begins With Your Team

Value creation in the dental environment begins with the dental team. Your staff are the agents or messengers of the value message. They must first create the perception that there is value in dentistry in a general

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Septembre
1995
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sense, and then create even more value for dentistry in your specific practice.

Once patients enter your practice door, incredible opportunities for creating value for dentistry exist. Emphasizing the importance of oral health to your patients' overall well-being is the first step. It has to be part of everything in your office, from the printed literature you have available (dental health pamphlets, practice newsletter etc.), to the way the dental hygienist educates patients about periodontal disease during their continuing care appointments. But what about the value of your particular practice? How is that achieved?

Your team must do what Thomas J. Winninger, the author of *Price Wars: How to Win the Battle for Your Customer*, suggests: Talk value. Talking value in the dental practice means that your staff aren't shy about sharing your successes. Assuming that you provide for your staff's oral health needs, your team has first-hand knowledge and experience — in their very own mouths — of the value of your dentistry. What better testimony could a patient ask for than to know that the staff trust you to provide them with dentistry that's second to none? Not only that, your staff refer their friends and family to you as well. From the vantage point of the patient, this can be quite compelling.

Value Is In the Eye Of the Beholder

Perception has a great deal to do with value, whether you're a retailer with a product or a dentist providing a health-care service. Customers, clients and patients must perceive that there is value in something before they will invest in it (or continue to invest in it).

However, dentistry poses a unique obstacle in this respect. Unlike a consumer product that demonstrates its relative worth to the customer, the value of a dental service may not be readily visible (unless you're dealing

with a cosmetic procedure). Its benefit is usually shielded from the patient, who must trust that the best quality care was provided. Because dentistry doesn't "sell itself" like a product (or even like some other services do), the dental team has to engage in a refined service strategy in order to create value.

Excellence in service can add value to dentistry, as it can to any business. One of the most telling examples of this is described in Winninger's book when he details how independent merchants can remain competitive despite the arrival of superstores such as Wal-Mart. The independents who slash their prices and offer exactly what the superstore does experience a quick demise — the superstore can always beat them on price.

"The price merchant can be deadly, but only to those who compete on price. Another niche in any market is selling value," says Winninger.

But those stores that offer what the megastores cannot provide — personalized service, ever-improving relationships with customers, upscale surroundings and value to offset price differences — actually thrive in this competitive environment. It forces them to think creatively and rise to the occasion.

So what type of value-added tactics can the dental team, which is offering a service that most of its patients either don't want or appreciate, do to express its commitment to excellence in service? There are a myriad of possibilities, but some good lessons can be extrapolated from other businesses. Men's Wearhouse, a U.S. retailer, contacts customers who purchase suits two weeks after the purchase to ensure that the suits fit. And happily, there are some dentists who understand this principle — they call patients who have undergone extensive treatment to determine how they're doing. Whether this call is made the evening after the treatment or the next day, etc., doesn't matter. It's not a difficult task for the dentist to pick up the

phone for a few minutes, but such a gesture goes a long way with patients. This type of service is the kind of thing that people talk about. It not only makes an existing patient happy, it most likely will boost your referral rate in the process.

Distinguishing Yourself

Winninger emphasizes that the value organization must explain itself to its prospective customers if it's to win them over. This means that you must position or reposition yourself to attract the segment of the market you're after. Trying to be all things to all people doesn't work in creating value, because your uniqueness message gets blurred.

The same holds true with patients. You need to identify the types of patients that best suit your practice, and then do what marketers call narrow casting, micromarketing or target marketing. What niche can and do you want to fill? Are you particularly good with seniors, and if so, what percentage of your patient base do they comprise? Maybe treating adolescents is what keeps you interested and challenged. Whatever the case is, you shouldn't just be thinking about your patients in terms of the "average patient," because each one is an individual with unique needs and wants. As Winninger says, "Differentiation is the secret weapon in competing."

And to differentiate yourself from the others, you need to learn as much as you can about your patients (from making notes in their charts about their interests and hobbies to soliciting their feedback through suggestion boxes, anonymous surveys, etc.) and then provide them with individualized service. For kids, this service might include taking their picture after their first visit. For adults, it might mean sending them an article on preventive care when they don't keep up with their continuing care ap-

pointments. Such activities demonstrate a concern for the individual.

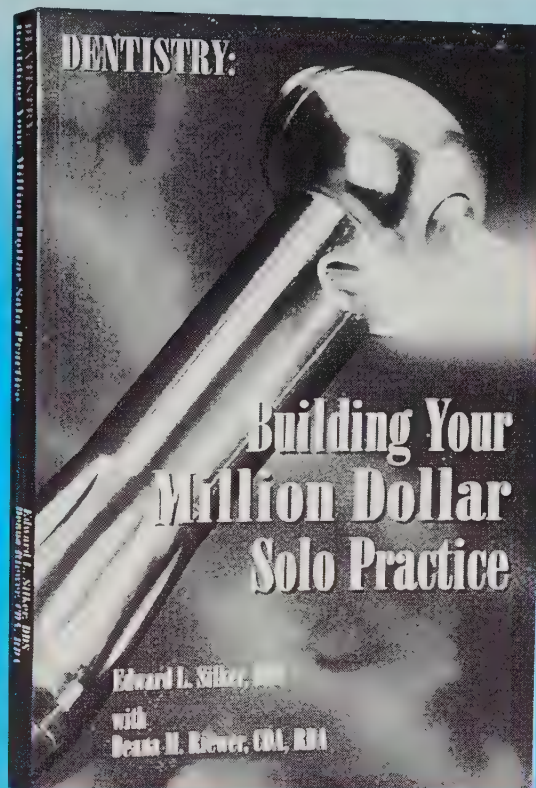
Technology can also help you to show patients that you care about quality dentistry and respect them as individuals. Let's take the example of an intraoral camera. Many practices are using this tool to show patients specific work that needs to be done in their mouths. The intraoral camera gives patients an opportunity to look at the area in question. But what these same practices don't do is use the intraoral camera as a follow-up tool, to show patients the work after it's been done. It's an ideal technology for this purpose, giving patients a glimpse of what you did for them (not unlike the hair stylist who hands you a mirror and spins you around in your seat so you can see what your new cut looks like in the back).

When a practice becomes generic, patients don't flinch at moving on to another dentist. You need to give them reasons — each and every time they visit, phone or interact with your practice — to stay with you. Even if they change residences, adding an extra 15 minutes of travel time to get to your location, loyal patients won't flinch. That's because you'll have shown them what they'll miss — exceptional value and service — if they make a switch.

To summarize the thinking behind building a value-based relationship, I turn to a final quote from Winner. Although Winner is talking about value with respect to a product in this example, the same concept holds true for the service economy.

"The relationship with a customer (or patient) doesn't end with the purchase. It begins with the purchase. The purchase of an item (or service) should be the beginning of a long-term relationship, cemented by the quality of your service and delivery." ■

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1995
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No. 9

763

What's Your

Periodontal disease is a leading cause of adult tooth loss. PSR, a new Periodontal Screening and Recording method, means early detection to reduce the risk and improve your patients' dental health.

Why has the CDA endorsed PSR?

A Preventative periodontal care is an important issue for Canadian dentists. As an integral part of our professional services program, the Canadian Dental Association and the Canadian Academy of Periodontology, with generous sponsorship from Procter and Gamble Inc., has created a series of seminars to introduce a new periodontal evaluation system that quickly screens patients for periodontal disease and records the results simply and easily. PSR is just one more way CDA is helping you enhance patient care and find new tools and techniques to support periodontal treatment.

How can I learn more about PSR?

A You and your staff can quickly learn more about this simple procedure at CDA's PSR Seminar. In addition to training by a periodontist appointed by the Canadian Academy of Periodontology, you'll receive a comprehensive starter kit. This kit includes recording stickers, helpful in-office marketing tools and background information that will help you integrate PSR into your practice and assist you with patient education.

How long does it take to perform PSR?

A Thanks to the special probe and simple scoring method, the procedure usually takes just 2-3 minutes. That's why it's easy to include PSR in all routine exams on adult patients.

What are the benefits for my patients?

1 Early detection

By evaluating all sites of potential risk, PSR is a highly sensitive technique that helps you detect periodontal diseases early to simplify treatment and offer patients greater peace of mind.

2 Speed

PSR takes just a few minutes to perform and can be added to routine exams without lengthening exam time.

3 Simplicity

Easy to administer and understand, PSR and its simple scoring system can easily be explained to patients to enhance awareness.

4 Cost Effectiveness

By using a simple periodontal probe designed for the PSR method, there is no expensive equipment to buy. The specially designed probes are available from a variety of suppliers.

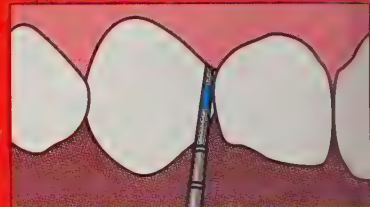
5 Recording Ease

PSR requires the recording of six scores, one for each sextant of the mouth. No extensive charting or narrative is required, which means more time for patient interaction.



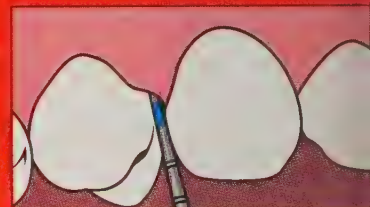
CODE 0

Coloured area of probe remains completely visible in the deepest crevice in the sextant.



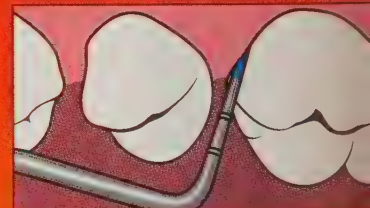
CODE 1

Coloured area of probe remains partially visible in the deepest crevice in the sextant.



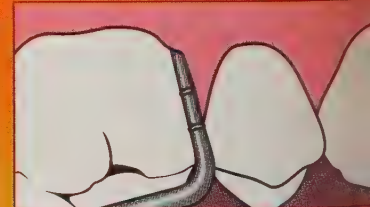
CODE 2

Coloured area of probe remains partially visible in the deepest crevice in the sextant.



CODE 3

Coloured area of probe remains partially visible in the deepest crevice in the sextant.



CODE 4

Coloured area of probe disappears completely, indicating a probing depth of greater than 5.5 mm.



Seminar

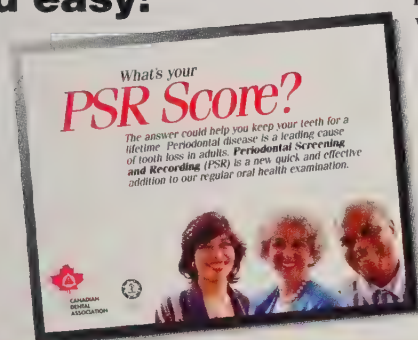


CANADIAN
DENTAL
ASSOCIATION

PSR Score?*



CDA's PSR Seminar makes early detection and recording simple and easy!



Through this seminar, you'll learn a fast and easy way to diagnose potential periodontal problems with the help of a specially designed colour-coded probe. You'll also learn how and when to advise periodontal care and when to schedule a full mouth periodontal examination and treatment planning.

Plan to join us today...

In order to introduce you to this essential periodontal diagnostic procedure, CDA has planned a number of seminars to be held in major centres across Canada. In addition to step-by-step training, dentists attending the seminar will receive a comprehensive PSR information kit.

But seating is limited, so don't delay. Complete and return the registration form below today or call 1-800-657-5688 and learn how the PSR program will help educate your patients about the risk of periodontal disease, simplify the recording process and save you time. Put PSR to work for you.

* Periodontal Screening and Recording, PSR, and the associated logotype are trademarks and servicemarks of the American Dental Association and related to a program jointly endorsed by the Canadian Dental Association and the Canadian Academy of Periodontology.

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PSR Seminars, Fall of 1995

Vancouver, BC	September 28 1995	Brandon, MB	October 12 1995	Sudbury, ON	November 2 1995
Edmonton, AB	September 28 1995	Toronto, ON	October 12 1995	North York, ON	November 9 1995
Winnipeg, MB	September 28 1995	Windsor, ON	October 12 1995	Sault Ste Marie, ON	November 9 1995
Toronto, ON	September 28 1995	Charlottetown, PE	October 12 1995	Kelowna, BC	November 16 1995
Hamilton, ON	September 28 1995	North Bay, ON	October 19 1995	Peterborough, ON	November 30 1995
Moncton, NB	September 28 1995	Thunder Bay, ON	October 19 1995	Toronto, ON	November 30 1995
Halifax, NS	September 28 1995	Fredericton, NB	October 19 1995	Quebec City, QC (French)	November 30 1995
Victoria, BC	October 5 1995	Saskatoon, SK	October 26 1995	Val D'Or, QC (French)	November 30 1995
Calgary, AB	October 5 1995	Kingston, ON	October 26 1995	Montreal, QC (French)	December 7 1995
London, ON	October 5 1995	Oakville, ON	October 26 1995	Rimouski, QC (French)	December 7 1995
Montreal, QC (English)	October 5 1995	Prince George, BC	November 2 1995	Trois-Rivières, QC (French)	December 14 1995
St. John's, NF	October 5 1995	Peace River, AB	November 2 1995	Sherbrooke, QC (French)	December 14 1995
Regina, SK	October 12 1995	Ottawa, ON (English)	November 2 1995		

Registration Form

Seminar location: _____ Seminar date: _____

Pre-registration is required. There will be no on-site registrations. Register early since enrollment is limited.

Name: _____

CDA Membership #: _____

Street: _____

City: _____

Prov.: _____ Postal Code: _____

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A receipt for the above registration fees will be issued to: _____

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Subtotal		\$
GST 7% of Subtotal (#R106845209)		\$
Total		\$

Sign-in and light supper and refreshments at 6:30 pm. Seminar presentation at 7:30 pm to 9:30 pm.

Register Today!

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Confirmation of your enrollment will be received by mail. Cancellation policy: Full refund 21 days prior to seminar. CE Credits will apply subject to Provincial approvals pending.

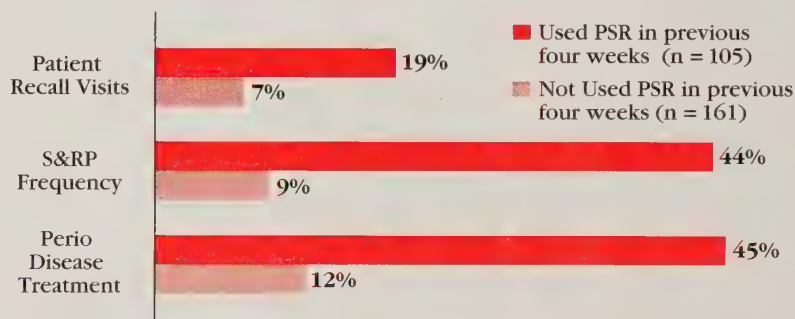
Probe for Results.

The CDA and CAP announce PSR.

- Periodontal Screening & Recording helps market periodontal health in your practice

% Increase Among PSR Adopters Versus Non-Adopters

1994 Total GP Dentists Aware of PSR



- PSR is proven to increase practice productivity, compliance and patient recall
- PSR is a simple, rapid *and* cost-effective method of screening for periodontal disease
- PSR is the *only* periodontal screening system endorsed by the CDA and CAP



Periodontal
Screening &
Recording*

An Early
Detection System

Brought to you by
The Canadian Dental Association and
The Canadian Academy of Periodontology

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An Early
Detection System

Periodontal Screening & Recording

BACKGROUND

Beginning in 1995, the dental profession in Canada will be introduced to a new periodontal evaluation system called Periodontal Screening and Recording (PSR).^{*} This system is being introduced by the Canadian Dental Association (CDA) and The Canadian Academy of Periodontology (CAP), with corporate sponsorship by Procter & Gamble Inc.

PSR is an easy to use, effective method to screen patients for periodontal disease and summarize necessary information with minimum documentation. In short, PSR will help the profession provide better patient care.

The key component of PSR is a specially designed periodontal probe that features a 0.5-mm-balled end and a coloured band extending 3.5 to 5.5 mm from the tip. The ball end enhances patient comfort, and aids in the detection of overhanging margins and subgingival calculus. (PSR probes, produced by a number of manufacturers, are available in plastic or metal.)

Simplicity is the core element of PSR. The mouth is divided into sextants. A complete oral examination is performed, measuring probing depths of six sites (mesiofacial, midfacial, distofacial, and the corresponding lingual / palatal surfaces) on each tooth. However, instead of the time-consuming charting associated with a comprehensive full-mouth periodontal examination, only the deepest probing depth of each sextant is charted in the patient's record using a unique PSR code.

The PSR code is determined by how much of the coloured band on the PSR probe is visible when it is placed in the gingival crevice. (A full explanation of PSR coding can be found in the Introduction section of the Training Kit binder under *How the PSR Scoring System Works*.)

The use of PSR provides a significant time savings for the dental office when patients are in good periodontal health because it can replace the need for a full-mouth periodontal exam. Simply stated, only six scores are recorded (one for each sextant) instead of the potential 192, using the standard periodontal exam. The rapid screening system allows the dentist to monitor patient health. Consistent and proper use of PSR documentation completes patient records for periodontal care.

While PSR is a time-saving evaluation of periodontal health, it is not intended to replace a complete periodontal examination. PSR acts as a screening system to indicate when a partial or full-mouth comprehensive examination is required.

PSR has been reviewed and approved by the CDA and CAP Boards of Trustees, and both organizations recommend that PSR be conducted for all patients as an integral part of oral examinations.

As the public becomes more aware of the benefits of periodontal health, PSR will enable the dental profession to meet the public demand for regular periodontal evaluation.

^{*} PSR is an adaptation of the Community Periodontal Index of Treatment Needs (CPITN), which is endorsed by the World Health Organization and the Federation Dentaire Internationale (FDI) for periodontal screening.



*An Early
Detection System*

WHO GETS PSR EVALUATIONS?

PSR is designed primarily for use with adult patients, age 18 and older, and has limited utility in screening children and adolescents. However, valuable information can be obtained in screening children and adolescents, giving due attention to pseudopocketing.

HOW DOES PSR HELP PERIODONTISTS?

PSR provides a tremendous opportunity for periodontists to enhance cooperative treatment planning with the rest of the dental profession. In short, PSR is seen as a great professional relations tool.

First of all, the CDA and CAP are relying on periodontists to be the key facilitators in bringing PSR to the rest of the dental profession. Therefore, the CDA and CAP have created materials to help this succeed.

The *Training Kit* binder contains all the materials periodontists need to introduce PSR to other dental professionals and help them incorporate it into their practices. It includes general PSR information, educational tools, and presentation slides with script. The kit will be available for distribution in the summer of 1995.

This variety of materials enables periodontists to tailor their presentation when promoting PSR to their peers. To actively promote PSR, periodontists may want to speak at dental meetings, to individual dental offices, to study groups, or in one-on-one settings. The Training Kit can also be used as a resource to help periodontists answer questions they might receive from dentists in their area. Periodontists who are knowledgeable about PSR, have good relationships with general practitioners, and participate in cooperative treatment planning will stand to gain the most in terms of referrals generated by PSR.

However, the implementation of PSR does not guarantee additional patient referrals nor is that its intent. According to PSR guidelines, patient management and treatment should be at the discretion of the examining dentist. The practitioner's clinical judgment will determine the need for consultation with a periodontist.

To understand more about how PSR works, periodontists are encouraged to use PSR where appropriate in their practices. Doing so will increase their familiarity with the system and improve communication between periodontists and general practitioners when conferring on patient treatment options.

HOW DOES PSR HELP OTHER DENTISTS?

The Canadian Dental Association and The Canadian Academy of Periodontology developed the system to help dentists detect periodontal disease early, quickly, and in a cost-effective manner. It is a simple system so that PSR can be easily incorporated into the basic oral examination.



*An Early
Detection System*

For the many dentists who regularly monitor patients' periodontal health, PSR offers a great time savings -- especially for screening healthy patients. Again, all sites at periodontal risk are examined, but only six scores are charted in the patient record.

For dentists who provide regular periodontal examinations, but do not record results regularly because of the lengthy charting process, proper, consistent, and documented use of PSR allows the dentist to evaluate a patient's periodontal status in a time-efficient manner.

PSR gives examining dentists the option to confer with a periodontist at any time. PSR allows the general practitioner to use his or her clinical expertise to determine the best treatment method, whether it involves referral to a specialist or not. The CDA and CAP incorporated these elements to ensure cooperative treatment planning in the best interest of the patient.

WHAT DOES PSR DO FOR PATIENTS?

PSR is a great educational tool to show patients how they are affected by periodontal diseases.

Dentists can inform their patients that they are using a new screening system for early periodontal disease detection. For those dentists using PSR, they will be able to point out periodontal trouble spots and give clear direction for at-home patient care. It is another tool dentists can use to drive home the importance of diligent personal oral care.

The overall program also includes educational material that dentists can give to their patients to help them understand the benefits of a PSR examination.

HOW IS PSR BEING INTRODUCED IN CANADA?

PSR is being introduced to Canadian dental professionals in two phases. In the first phase, PSR will be presented to periodontists at the CAP convention in the spring of 1995. Over the course of the summer, periodontists will be provided with PSR Training Kits, which include all the materials contained in the PSR binder as well as a PSR Slide presentation.

In the second phase, PSR will be presented to general dentists at the CDA convention in the fall of 1995. During the fall months, the CDA has planned a PSR continuing education lecture series, which will be available in most major Canadian cities. More information about this lecture series may be obtained from the CDA. Concurrently with the CDA lecture series and continuing until the spring of 1996, periodontists will be conducting similar PSR continuing education lectures, nation-wide, at regional and local venues. Information about these lectures can be obtained from your local periodontist or your local dental society.



PSR Offers Quick, Easy Periodontal Screening

Terence Davis, BA, Dip. J., CAE

When CDA introduced its new Periodontal Screening and Recording (PSR) program in Ottawa last month, Canadian dentists gained access to a unique new tool for the early detection and diagnosis of periodontal disease.

Consisting of a special probe and a unique numerical charting system, PSR allows dentists to screen and record a patient's periodontal status in less than five minutes — and determine if further treatment, including a comprehensive full-mouth periodontal screening and charting is required.

Another advantage of PSR is the consistency of results between patients and between providers. The PSR probe incorporates a distinctive colored band that begins 3.5 mm from the probe's tip and extends to a point 5.5 mm from the tip. PSR codes are determined based on the amount of the 2.0 mm colored band that is visible on gentle probing, as well as on the presence of bleeding, calculus and/or defective margins.

Although each tooth is examined individually, only the highest PSR code obtained in each of six pre-determined sextants of the mouth is actually recorded. Code 0, for example, represents excellent periodontal health, while Code 4 indicates that further treatment will be necessary.

The patient's PSR "score" represents a summary of the six codes recorded during the PSR examination. For example, a Code 0 is recorded when the colored area of the probe remains completely vis-

ible on gentle probing of the deepest pocket in the sextant being tested, and there is no evidence of bleeding, calculus or defective margins. Conversely, a Code 4 is noted when the colored area of the probe is no longer visible on gentle probing of the deepest pocket in the sextant, indicating a probing depth of greater than 5.5 mm. Code 1, Code 2, or Code 3 may also be recorded, depending on how much of the colored area of the probe remains visible on gentle probing, as well as on the presence of bleeding, calculus, or defective margins.

The codes obtained in each sextant of the patient's mouth are recorded numerically — as code 0, 1, 2, 3, or 4 — on a special PSR chart. Because PSR is designed to be a part of the regular patient examination, the dentist can easily compare the PSR scores obtained from one patient visit to the next. This allows the dentist to monitor changes in the periodontal status of patients, as well as to detect periodontal disease in its earliest stages.

A unique feature of the CDA PSR program is the "Script for After PSR." Developed by CDA and the Canadian Academy of Periodontology, the script is designed to help general dentists manage the periodontal care of their patients. For example, it suggests that patients with no significant areas of periodontal concern (low PSR score) can be seen by the general dentist or the hygienist for regular periodontal care. But if a patient demonstrates a high PSR score, he

or she should be given a comprehensive periodontal examination to determine if further treatment is required. If this proves to be the case, the general dentist and the hygienist may proceed with more conservative periodontal care. Regular follow-up will determine if the patient is responding appropriately to treatment, or if referral to a periodontist is indicated. The script also suggests possible models for care following the referral of a patient.

CDA's PSR initiative is based on a similar program that was introduced in the United States by the American Dental Association (ADA), Procter and Gamble, and the American Academy of Periodontology in 1992. ADA holds the rights to the PSR name and logo.

Following its launch at the CDA Convention, PSR will be provided to Canadian dentists in conjunction with a unique national seminar program. Seminars explaining PSR and how to use the system will be offered in more than 25 cities across Canada beginning this month. Dentists who attend the seminar will receive a comprehensive PSR information kit. As well as a Certificate of Attendance suitable for framing and wall hanging.

The launch of PSR in Canada is a joint initiative of CDA, the Canadian Academy of Periodontology, and Procter and Gamble Canada, Inc.

To obtain more information on PSR and/or the seminar program, contact CDA's membership services department at 1-800-657-5688, or fax: 1(613) 523-7736. ■



CANADIAN DENTAL ASSOCIATION

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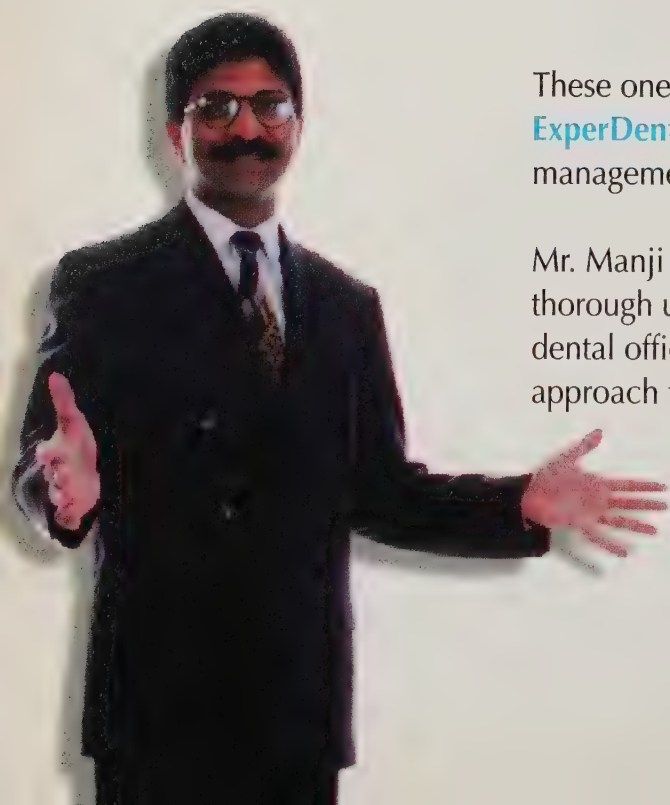
- A reduced incidence of dental disease
- An increase in the number of practising dentists
- Declining disposable incomes
- Competitive pressures on employers to reduce employee benefits
- The changing relationship between employees and employers
- Changing dental technologies
- An aging population...

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Surviving and Thriving	London	June 23
The Bottom Line	Victoria	October 13
The Bottom Line	Toronto	November 10
Reaching Out	Halifax	November 17
The Bottom Line	Fredericton	November 18
The Bottom Line	Ottawa	December 1
Reaching Out	Calgary	January 19, 1996
The Bottom Line	Edmonton	January 20
Reaching Out	Sudbury	January 26
Reaching Out	Windsor	February 2
Reaching Out	Toronto	February 9
Reaching Out	Montreal	February 16**
The Bottom Line	Saskatoon	March 1
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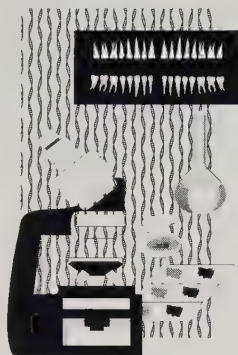
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RESEARCH



Detection Of Premalignant Oral Lesions: A 10 Year Retrospective Study In Alberta

E. Peters, DDS, M.Sc., FRCD(C)

W.T. McGaw, DDS, MD, M.Sc., FRCD(C)

Edmonton

ABSTRACT

A comprehensive review of all oral premalignant lesions and squamous cell carcinomas (SCC) diagnosed and biopsied by the oral pathology diagnostic service at the University of Alberta over two sequential five-year periods (1984-1988 and 1989-1993) was undertaken. There was a disproportionate increase in the number of premalignant biopsies conducted in 1989-93 relative to the number of SCC biopsies, suggesting an improvement in the detection of oral pre-malignancy by dentists.

SOMMAIRE

On a entrepris une revue complète de tous les cas, dans la bouche, de lésion précancéreuse et d'épithélioma malpighien spino-cellulaire (EMSC) qui, au Service diagnostique de pathologie buccale de l'Université de l'Alberta, ont fait l'objet d'un diagnostic et d'une biopsie pendant deux périodes successives de cinq ans chacune (1984-1988 et 1989-1993). Au cours de la seconde période, il y a eu un nombre disproportionné de biopsies effectuées par rapport à celui des biopsies d'EMSC, ce qui suggère une amélioration dans la détection, par les dentistes, des lésions précancéreuses dans la bouche.

Introduction

The predominant oral cancer risk in North America is squamous cell carcinoma (SCC), which accounts for more than 90 per cent of all oral malignancies.¹ A review of 13 studies involving about 4,000 patients indicates that between 67 and 77 per cent of oral SCCs are not diagnosed until they have reached a relatively advanced stage (T2 > 2.0 cm).² The continuing poor prognosis for patients with this malignancy is directly related to its late diagnosis. This is frustrating for two reasons. First, the oral mucosa is directly accessible for examination and large numbers of the population routinely receive oral examinations for dentally-related concerns; second, oral SCC is typically preceded by a progressive series of clinically-evident alterations in the mucosa.

The "premalignant" clinical stigmata correspond to histologic changes in the mucosal epithelium, known as epithelial dysplasia. These dysplasias are ranked as mild, moderate or severe, depending on the degree of epithelial atypia noted on histologic examination. At the most severe end of the premalignant spectrum, or carcinoma-in-situ, the epithelium shows full thickness dysplasia. Clinically, such changes present as

redness (erythroplakia), whiteness (leukoplakia), alterations in the normal surface mucosal morphology, or combinations of these features, sometimes in association with ulceration.

Ideally, patients showing premalignant changes should be identified to permit conservative management. However, unchanging mortality statistics, studies showing most malignancies are advanced at diagnosis, and others documenting early mismanagement of many oral cancers,²⁻⁶ suggests that there have been no significant advances in the early diagnosis of oral malignancies.⁷ Nevertheless, changing trends in dental practice, particularly with respect to the diagnosis of premalignant lesions, are difficult to discern. Cases where diagnosis is accomplished at the premalignant stage and the development of malignancy is aborted are not included in the oral cancer statistics. Furthermore, it would take several years for the earlier detection of oral SCC by dentists to be reflected in improved mortality statistics.

As dentists become increasingly sensitive to oral cancer, and their moral and legal responsibility to conduct a complete soft tissue oral examination, we should anticipate an improvement in the rate of early diagnosis. This trend will ul-

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Table I

The Various Premalignant Lesions and SCC As a Percentage Of All Biopsies In the 1984-1988 and 1989-1993 intervals

	1984-1988	1989-1993
Mild Dysplasia	0.64 %	0.83 %
Moderate Dysplasia	0.23 %	0.26 %
Severe Dysplasia	0.07 %	0.14 %
SCC	0.71 %	0.69 %

timately be reflected in a disproportionate increase in the number of biopsies of premalignant lesions as compared to biopsies of established SCC.

In an attempt to determine whether there has been any improvement in the detection of premalignant lesions in Alberta, we compared the premalignant to malignant (P:M) biopsy ratios documented by the University of Alberta's oral pathology diagnostic service over two sequential five-year periods. In addition, the clinicians involved in the detection, referral and biopsy of premalignant and malignant lesions were profiled to relate possible differences to changes in clinical practice.

Methods

The University of Alberta oral pathology archives were reviewed to identify all lesions that had been diagnosed as mild, moderate or severe epithelial dysplasia, carcinoma-in-situ or SCC over a 10-year period (1984-1993). Severe dysplasia and carcinoma-in-situ were regarded as a single group of lesions because of the difficulty in consistently distinguishing between these two categories.⁸

Biopsies recorded in University of Alberta archives are derived from all parts of Alberta. The submitting clinicians are almost exclusively general dentists and dental specialists, including maxillofacial surgeons. All of the original material was diagnosed by the same three oral pathologists, two of whom practised in Alberta for the entire 10-year period. This ensured a consistency in diagnosis as well as a rela-

tively uniform application of histopathologic criteria.

Both the less aggressive verrucous carcinoma and its precursor, verrucous hyperplasias, were excluded from this study, as the criteria for their diagnosis had not been consistently applied. Furthermore, these lesions, while significant, are generally amenable to conservative management, and do not present the clinical challenge of SCCs.

Profiles of the different types of premalignant and malignant lesions diagnosed during two sequential five-year periods (1984-1988 and 1989-1993) were determined, and the respective P:M ratios were calculated for comparison. The contributions of general dentists and specialists in the biopsy or referral of the various lesions were also analysed for each period.

Results

A total of 6,089 and 9,284 lesions, respectively, were diagnosed and biopsied in the two sequential five-year periods (1984-1988 and 1989-1993). There was virtually no change in SCCs, as a percentage of total lesions diagnosed, between the two periods (0.71 per cent in 1984-1988 and 0.69 per cent in 1989-1993). However, there was a global increase in premalignant lesions, from 0.94 per cent of total lesions in the first five-year period to 1.23 per cent in the second. This increase was observed in all categories of premalignant lesions (Table I), with the largest numerical increase occurring in the mild dysplasia group. The net result was an increase in the premalignant to malignant biopsy ratio from 1.33

in the first time interval to 1.78 in the second.

Table II shows the origin of the biopsy material in each five-year period. Malignancies were most likely to be biopsied by an oral and maxillofacial surgeon (OMS) or, to a lesser extent, by an oral pathologist. These two groups also performed the majority of premalignant biopsies, although general dentists provided a relatively much higher percentage of these biopsies. The percentage of premalignant biopsies performed by general dentists showed a slight decrease in the second five-year interval, and the increase in premalignant biopsies noted during this period was caused primarily by the changed profile of OMS biopsies. However, since both oral pathologists and surgeons usually see patients on a referral basis only, it is likely that the vast majority of cases, in either period, were initially detected in general dental offices. In the 60 cases in which referrals were specifically noted, 58 were made by dentists and two by physicians. More referrals were documented in the 1989-93 period (56.7 per cent) than in the 1984-88 period (43.3 per cent).

Discussion

The detection of oral SCCs has been a shared responsibility between dentists and physicians.^{4,9,10} Patients with obvious SCCs usually present to their physician. Dentists typically detect oral cancers at an earlier stage.^{4,10} Ideally, however, lesions should be detected at an early, preferably premalignant and asymptomatic stage, before they reach a size large enough to motivate a patient to seek professional advice. The regular dental check-up appears to provide the best opportunity to perform this screening.

Our results suggest that dentists are currently detecting more premalignant lesions. Furthermore, there seems to be an ongoing tendency to refer these patients to specialists for further evaluation and biopsy once the clinically suspicious lesion has been identified. Although the overall impact of this positive trend on the oral cancer

Table II

The Percentage Of Premalignant Or Malignant Lesions That Were Biopsied By Oral and Maxillofacial Surgeons (OMS), Oral Pathologists (OP), General Dentists Or Other Dental Specialists (Other) In the 1984-1988 and 1989-1993 Intervals

	OMS		OP		Dentist		Other	
	1984-88	1989-93	1984-88	1989-93	1984-88	1989-93	1984-88	1989-93
Premalignant Lesions	44.1 %	60.1 %	25.4 %	14.8 %	23.7 %	21.3 %	6.8 %	3.7 %
SCC	58.1 %	64.2 %	32.6 %	25.0 %	4.7 %	7.1 %	4.7 %	3.6 %

problem is unclear, the majority of premalignant lesions are likely still escaping detection. It is possible to make a rough estimate of the anticipated number of epithelial dysplasias based on studies that documented the percentage of dysplasias undergoing malignant transformation. This percentage would be influenced by the degree of dysplasia, the aggressiveness of treatment at the time of the initial dysplasia diagnosis, the follow-up period, and the risk factors that predisposed the patient to the development of malignancy. Nevertheless, four studies¹¹⁻¹⁴ presented relatively consistent data indicating that 11 to 14 per cent of epithelial dysplasias develop into carcinomas. This suggests that if all epithelial dysplasias were biopsied, 7.1 to 9.1 times more dysplasias would be observed relative to oral SCCs (P:M ratios of 7.1-9.1:1). A fifth study¹⁵ documented a malignant transformation rate of 36 per cent (corresponding to a P:M ratio of 2.8:1). The improved P:M ratios seen in our study over the 10 year period examined (1.33:1, increasing to 1.78:1) fall considerably short of these P:M biopsy ratios. Other than the possibility, supported by at least one study,⁹ that oral soft tissue examinations are not being adequately performed in some dental offices, there are a wide range of possible reasons for this shortcoming.

It is feasible, for example, that individuals who engage in high-risk activities such as tobacco and alcohol use are less likely to routinely visit dental offices, and therefore escape detection. A further possibility relates to the changing profile of dental services delivery in Alberta. The older,

high-risk population for oral cancer includes a high proportion of completely or partially edentulous individuals. Many of these individuals do not undergo regular soft tissue examinations by a dental practitioner, as changes in health-care regulations permit the direct delivery of removable prosthodontics services by denturists. Alternatively, some patients may present to medical providers for evaluation of oral lesions, and would not, therefore, be included in this study. Although the biopsy data and patient documentation used in this study were derived from all parts of Alberta, contributors were almost exclusively from the dental profession. As such, the results document only the improved diagnostic record of the dental profession.

Identifying patients at risk for oral SCC is clearly a major goal. Early detection of epithelial dysplasia can result in a significant treatment-planning challenge, however, as extensive areas of mucosa frequently demonstrate variable degrees of dysplasia. This may be the result of the diffuse field cancerization process that occurs in smokers, with the result that extensive mucosal areas throughout the oral cavity and entire aerodigestive tract are at risk of developing multiple foci of malignant lesions.¹⁶ Not all of these lesions will progress to malignancy, however, and it is difficult to justify extensive prophylactic surgical procedures. Traditionally, patients with extensive or multifocal lesions of mild to moderate dysplasia are encouraged to cease smoking and reduce alcohol intake, and are placed on careful follow-up. The use of the carbon dioxide laser,

which allows the relatively selective removal of surface epithelium, has provided a more conservative approach to treatment than conventional surgery.¹⁷

Recent studies indicate that early dysplastic lesions could eventually be intercepted using various potential chemoprophylactic agents. Preliminary trials involving the topical use of cancer chemotherapeutic agents such as bleomycin have shown some promise in the treatment of leukoplakia lesions with mild dysplasia.¹⁸ There is also some evidence that gamma interferon may provide a benefit in the "stabilization" of dysplastic mucosal epithelium.¹⁹ However, the most encouraging results have been derived from studies of various vitamin A derivatives.

Vitamin A (retinol) is essential for the proper maintenance of the function and structural integrity of epithelial cells. Retinol, beta-carotene (a retinol precursor), and synthetic retinoids have been shown to modulate the growth and differentiation of normal, premalignant, and malignant cells,²⁰⁻²² and have been found to be effective inhibitors of chemical carcinogenesis in animal studies.²³ Reduced retinol serum levels have been found in patients with oral premalignant or malignant lesions,²⁴ and it has been suggested that retinol deficiency may be one of the co-factors promoting oral carcinogenesis.

More effective prophylactic therapy for premalignant oral lesions is possible with 13-cis-retinoic acid (13-cRA), a stereoisomer of retinol that has been studied extensively in the treatment of premalignant oral mucosal lesions,^{25,26} than with either retinol or beta-carotene.

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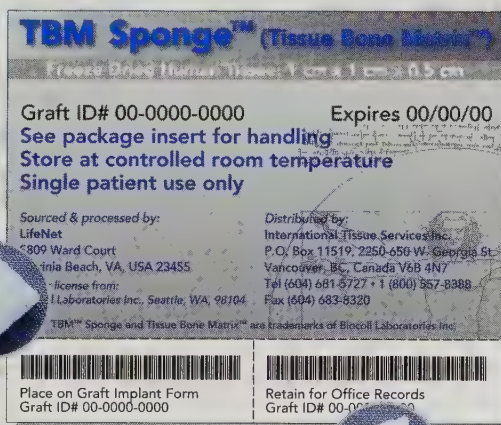
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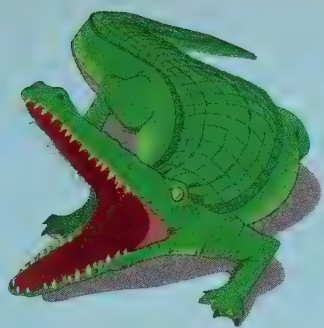
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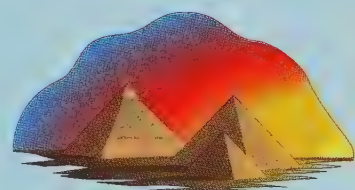
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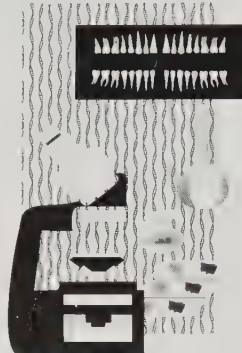
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RESEARCH



Human Bites To the Hand

M.M. Carr, B.Sc., DDS, MD

Halifax, N.S.

ABSTRACT

Human bites to the hand or penetrating injuries contaminated with saliva can be a source of aggressive infection and debilitating injury. These types of injuries may also be a mode for the transmission of disease, notably hepatitis B. Dental personnel have an increased risk of experiencing bite injuries and should understand the general principles of appropriate management. Staphylococcal or streptococcal species are often associated with infected bite injuries, and amoxicillin and clavulanate are currently advised for prophylaxis. Wound cleansing and careful monitoring, combined with appropriate prophylaxis, are the mainstays of treatment.

SOMMAIRE

Les morsures faites aux mains par des humains ou les blessures par pénétration contaminées par de la salive peuvent être une cause d'infection agressive et de plaie débilitante. Les blessures de ce genre peuvent également être un moyen pour transmettre des maladies, notamment l'hépatite B. Comme pour les professionnels dentaires le risque d'être mordu est plus grand, ils doivent connaître les principes généraux d'une bonne gestion dans ces cas. Les staphylocoques et les streptocoques sont souvent asso-

ciés aux morsures infectées, et l'amoxicilline et le clavulanate sont actuellement conseillés comme mesure prophylactique. Le nettoyage de la plaie et une surveillance attentive, associés à une bonne prophylaxie, sont les principaux éléments de traitement.

Introduction

Dentists and hygienists are at risk of hand infections related to the inoculation of the skin tissue with oral flora. These injuries can take the form of human bites or penetrating wounds from instruments contaminated with saliva.¹ Human oral flora is notoriously virulent in these situations, causing serious hand infections that can keep the practitioner away from work for extended periods (Fig. 1). This article clarifies the problems that can result from human bites to the hand, as well as possible solutions.

Morbidity Of Human Bites To the Hand

Some authors estimate that the infection rate for human bites to the hand may be as high as 50 per cent,²⁻⁵ and that 25 per cent of these injuries result in residual disabilities.⁶ The most common disability is joint stiffness,^{1,6} but digit amputations, recurrent infections and osteomyelitis are relatively

common.^{1,5,7,8} In one study of human bite injuries,⁸ the average morbidity was 17.5 days.

Hand infections often result in significant long-term sequelae. A large number of the hand's functioning parts are very close together, surrounded by a relatively tight outer covering. Because of the complex actions of the hand, even a small degree of loss in range of motion can have a significant effect, especially to a practising dentist.

Transmission Of Disease Through Bites

There have been claims that hepatitis B, syphilis, tuberculosis, actinomycosis, tetanus, and AIDS can be transmitted by human bites.^{1,4,6,9-14}

Several well documented cases of hepatitis B (HBV) transmission via human bites have been reported.^{10,14,15} Seventy-five per cent of HBV-positive patients have the antigen for the virus in their saliva.¹⁶ Some researchers believe that transmission occurs due to the inoculation of the biter's blood (present in the oral cavity due to trauma or inflammation) into the victim's tissues.¹⁷

There is disagreement about whether human bites can transmit tetanus, since there have been no reported cases. Some authors claim that the causative organism,



Fig. 1: This woman had sustained a superficial bite on the distal aspect of her right middle finger five days previously. She did not seek medical care until presenting with this infection. Although it gradually improved with antibiotics, she suffers from permanent joint stiffness.

Clostridium tetani, can be isolated from the oral cavity,^{4,13} while others claim it is never found.¹⁷⁻²⁰

More debate exists about whether the human immunodeficiency virus (HIV) is transmitted through bites. Two cases have been reported. In the first case, a child who was bitten by his HIV-positive sibling subsequently seroconverted.¹² The second was vaguely described and anonymously reported.¹¹

In another study of eight people bitten by AIDS patients, all eight were HIV-negative an average of 2.5 years later.²¹ The viral titre for HIV is lower in saliva than in blood, and fewer saliva samples than blood samples are positive.^{22,23} Despite these reassurances, we cannot identify those at high risk of HIV transmission without appropriate testing.²⁴

Bacteriology

Oral commensals cause infection following human bites, which is not surprising considering that 1.0 mL of saliva can contain 10⁸ bacteria.^{4,7} In more than 80 per cent of cases, cultures from fresh wounds fail to grow microorganisms,⁴ however, infected wounds often have different culture results

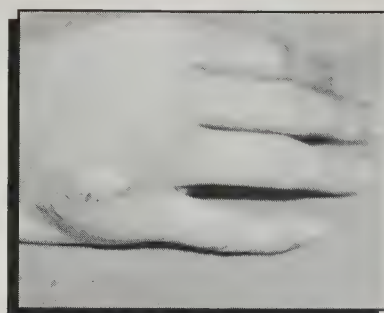


Fig. 2: A human bite related to an assault several days previously, located over the right fifth metacarpal region. The white area represents necrotic tissue that is surrounded by a zone of erythema and edema. This wound required debridement and intravenous antibiotics.

than initial wounds.^{4,25} Most cultures from infected human bite injuries are mixed, with *Staphylococcus aureus* and streptococcal species being found most frequently.^{1,3-5,7,8,13,26-29} *S. aureus* is associated with major infections and severe complications.^{1,5,28} Currently, cloxacillin is recommended for first-line therapy, with erythromycin, clindamycin, vancomycin, and ciprofloxacin as second choices.³⁰ Streptococci are usually sensitive to penicillin, with erythromycin used as second-line therapy.³⁰

About half of the mixed cultures grow anaerobes, most commonly bacteroides species and *Eikenella corrodens*.^{4,6,26} *Eikenella* is a slow-growing opportunistic oral commensal that is frequently associated with abscess formation, and is currently susceptible to penicillin

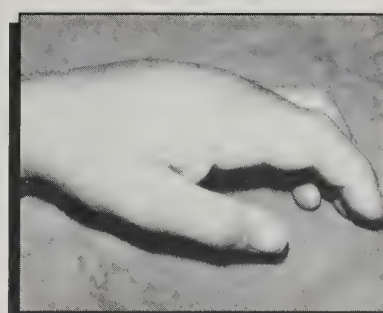


Fig. 3: The bite wound is visible on the dorsum of the hand at the base of the index finger. The gross edema of the dorsum and the involved finger necessitated intravenous antibiotics. Serious infections like this sometimes require fasciotomy to prevent pressure necrosis of underlying structures.

or ampicillin, with erythromycin and tetracycline as second-line agents.^{26,30}

The most effective and economical choice of antibiotic in human bite injury prophylaxis is amoxicillin/clavulanate, because it covers some *S. aureus*, streptococci and most anaerobes.³⁰

Treatment

Dental personnel who sustain human bites to their hands should seek experienced medical care (Table I), even if the initial appearance of the injury is benign. It is also important to document the neurovascular and motor status of the hand, as well as the extent of the injury.⁴

The two principles of treatment are mechanical debridement of the wound and appropriate antibi-

TABLE I

Early Management of Human Bites To the Hand

1. Document neurovascular, motor status and extent of wound
2. Irrigation with copious volumes of normal saline under pressure with a syringe
3. Debride devascularized tissue
4. Leave open, rest and elevate the extremity
5. Tetanus and hepatitis B prophylaxis; counselling with respect to HIV transmission
6. Prophylactic antibiotics — in 1994, oral amoxicillin and clavulanate were recommended
7. Wound checks daily for two days
8. Wound swabs if signs of infection

otic coverage.^{4,5,31} Initial wound management consists of irrigation with large volumes of sterile normal saline, preferably at high pressure.⁴ Devascularized tissue (Fig. 2) should be excised and sent for culture, although initial swabs are not necessary.^{4,25} Wounds should be left open, dressed, and kept elevated and immobilized to rest the area.^{5,25,31,32} Depending on the mechanism of injury, radiographic evaluation may be necessary to rule out fractures or the presence of tooth fragments.³¹ A randomized controlled trial has shown that prophylactic antibiotics reduce the infection rate of these types of injuries, but there is disagreement as to the precise choice of antibiotic.²⁹

Dental personnel should keep their hepatitis B and tetanus immunizations up to date. If this is not the case, hepatitis B immune globulin and tetanus prophylaxis with active immunization, using tetanus immune globulin and passive immunization with tetanus toxoid, should be administered as soon as possible after a bite injury has occurred.^{5,17,27,31,32}

The wound must be inspected daily for the first two days after injury.^{5,31} At the first signs of infection (erythema, swelling, pus), swabs should be sent for culture and, pending the results, the antibiotics changed.⁵ Intravenous antibiotics may be necessary at this point, combined with extensive debridement or fasciotomy. Unfortunately, this may result in loss of the vital structures of the hand and permanent disability (Fig. 3). ■

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Dr. Carr is a resident in the department of otolaryngology, Camp Hill Medical Centre, Halifax, N.S.

Reprint requests to: Dr. M.M. Carr, Dept. of Otolaryngology, Camp Hill Medical Centre, 1335 Queen St., Halifax, N.S. B3J 2H6.

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DID YOU KNOW?

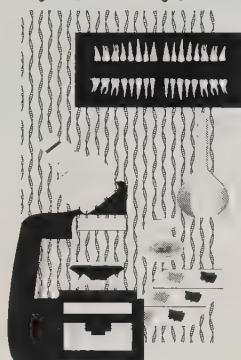
**What Company
 Uses the Most
 Sugar?**

Coca Cola buys more sugar and vanilla than any other company in the world.

When a new version of Coke appeared in 1985 without vanilla, the economy of Madagascar slumped.

(Source: Tufts University Diet and Nutrition Letter, February 1995.)

RESEARCH



The Use Of Diagnostic Tests To Aid Clinical Diagnosis

D.C. Matthews, DDS, Dip. Perio.

D.W. Banting, DDS, PhD

R.N. Bohay, DMD, MRCD(C)

ABSTRACT

Clinical decision making in dentistry involves some uncertainty and error, but in the absence of good clinical research it is often more of an art than a science. This article demonstrates a way in which clinicians can consistently and effectively base the diagnostic process on scientific evidence. The authors examine the selection and utility of supplemental diagnostic tests, describe the properties of these tests, and explain how test results can be used to augment clinical opinion. To aid the dental clinician in the decision making process, a step-by-step strategy is presented for the detection of squamous cell carcinoma using toluidine blue dye.

Key words: Diagnosis, Diagnostic Tests, Decision Making, Toluidine Blue Dye

SOMMAIRE

En dentisterie, prendre une décision clinique comporte une marge d'incertitude et d'erreur. Aussi, en l'absence de bonnes recherches cliniques, est-ce souvent plus un art qu'une science. Dans cet article, on montre une façon pour les cliniciens de fonder constamment et efficacement la procédure diagnostique sur des preuves scientifiques. On se penche sur le choix et l'utilité des tests diagnostiques complémen-

taires, en décrit les vertus et explique comment leurs résultats peuvent servir à étayer une opinion clinique. Afin d'aider le clinicien dentaire dans ses prises de décision, on présente point par point une stratégie pour la détection d'un épithélioma malpighien spino-cellulaire à l'aide de la teinture au bleu de toluidine.

Mots clés: diagnostic, test diagnostique, prise de décision, bleu de toluidine (teinture au).

Introduction

A diagnostic test that uses toluidine blue dye to detect oral squamous cell carcinoma has become a source of recent controversy.^{1,2} The anti-dye group asserts that experienced clinicians require only visual and tactile senses to make a clinical diagnosis. The pro-dye group, in turn, argues that clinicians who encounter oral malignancies less frequently find it difficult to make a diagnosis based on clinical signs alone, especially in the early stages of the disease.

The advocates of the strategic toluidine blue test base their support on studies assessing its performance.³⁻⁵ But what do the results of these studies really mean? Can they help the dental practitioner decide whether toluidine blue is, in fact, a valuable adjunct to clinical judgment? Will the test results only confirm what the clini-

cian already suspects based on a history and clinical examination, or could they lead to an alternate diagnosis which, in turn, could affect patient management?

Using toluidine blue dye as an example, this paper reviews the diagnostic process and presents a strategy that clinicians should consider when deciding whether or not to employ a diagnostic test.

Clinical Diagnosis

In dentistry, the clinical diagnosis of an oral condition is usually made following the examination of the patient, without resorting to supplemental diagnostic tests. It is a multi-faceted information-gathering process that typically involves visual inspection, palpation, percussion and, in many instances, periodontal probing and radiographic examination. In addition, the clinician must take the patient history and the presenting signs and symptoms into account.

The information obtained during the examination of the patient, together with the clinician's knowledge of disease and his or her own clinical experience, is (consciously or otherwise) collated, analyzed and assimilated. The end result of the process is a clinical diagnosis.

In fact, a clinical diagnosis is an estimate, made by the clinician after taking into account the possible risk factors, clinical findings and how commonly the disease occurs

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in the population (i.e. disease prevalence), of the probability that the patient has a specific condition. This "best-guess" approach has been described as the "art" of diagnosis.⁶

The "art" of this type of diagnosis is apparent when you consider the wide variation that exists in the signs and symptoms manifested by individual patients, as well as in the interpretation of those signs and symptoms by different clinicians. In some instances, the correct diagnosis is obvious, but not always. For example, while few clinicians would hesitate to conclude that a large, cavitated, buccal lesion is caries, the diagnosis of occlusal pit and fissure caries is not always as straight-forward.

Although the diagnostic process, as described, is considerably more accurate than chance, there is often a high level of uncertainty associated with it. This has led clinicians to look to specific diagnostic tests for assistance.

Clearly, dentists must resist using diagnostic tests as a substitute for a thorough clinical assessment. A diagnostic test may be just as inaccurate as clinical judgment, or even more so. Before a new or even a standard but unproven diagnostic test becomes part of the clinician's armamentarium in the diagnosis of disease, it should be subjected to rigorous evaluation and compared to a proven method (the gold standard) of diagnosis. The gold standard is usually a histologic assessment, which is often the most reliable and valid measure of the presence or absence of disease. Histologic analysis may not always be feasible, however, and other clinically acceptable standards that are less invasive, less time-consuming, or less costly, may be used.

For example, a patient may present with a history and clinical findings that strongly suggest a periapical abscess. A periapical radiolucency on radiographic examination will confirm the diagnosis. In another case, a radiographic examination may reveal a radiolucent lesion surrounding the crown of an impacted tooth. This is most often a dentigerous cyst. It is a known fact, however, that some

Table 1

Diagnostic Test Results and Calculation Of Test Properties

	Gold Standard Determination Of Disease			
Diagnostic Test Results		+ (Disease Present)	- (Disease Absent)	
	+	True Positive a	b False Positive	a+b
	-	False Negative c	d True Negative	c+d
		a+c	b+d	a+b+c+d

$$\text{Sensitivity} = a/a+c$$

$$\text{Specificity} = d/b+d$$

$$+LR = \text{Sensitivity}/1 - \text{Specificity}$$

$$-LR = \text{Specificity}/1 - \text{Sensitivity}$$

$$\text{Accuracy} = a+d/a+b+c+d$$

$$+LR = \text{Positive Likelihood Ratio}$$

$$-LR = \text{Negative Likelihood Ratio}$$

odontogenic keratocysts occur in dentigerous relationships. Here, histologic diagnosis is the only method of definitive diagnosis.

In the first example, the radiograph is considered the gold standard. In the second, the radiograph leads to a working diagnosis, but the gold standard is the histologic finding. Monitoring the loss of clinical attachment over time as a measurement of periodontal disease activity is another example of a clinical gold standard.⁷

Selection Of a Diagnostic Test

In choosing a diagnostic test to confirm or exclude a diagnosis, several criteria should be considered. The primary criterion is whether the information obtained through the test will have a beneficial impact on patient care. If the diagnostic test does not lead to earlier and more accurate identification of disease or improve the patient's outcome, the value of the test will be marginal. Consider the case of a tooth with a large buccal cavitation. Despite its allure, a caries activity test will not provide any further information required by the clinician to diagnose and treat the lesion. However, when a clinician is truly uncertain about a diagnosis, the supplementary information provided by a diagnostic test can dramatically enhance his or her ability to confirm a clinical diagnosis.

Diagnostic tests perform best when the estimated probability of the condition, based on clinical signs and symptoms, is around 50

per cent. Since flipping a coin would also result in the clinician being right 50 per cent of the time, his or her best estimate before further diagnostic testing is undertaken (i.e. the pre-test probability) is no better than chance. In these cases, the information provided by a diagnostic test, coupled with the clinician's estimate of the likelihood of the presence of disease, can be used to improve diagnostic accuracy.

The application and interpretation of a diagnostic test must be based on knowledge about the suspected disease as well as the properties of the selected test. Clinicians considering the use of a diagnostic test to supplement clinical judgment should therefore ask the following questions:

1. What is the likelihood of the disease being present, or occurring, given the history, clinical findings and presence of risk factors?
2. How serious is the condition and what is the effect of delayed or inaccurate diagnosis?
3. Is there a diagnostic test available for the suspected condition and, if so, what are the properties of the test?
4. Are the costs, risks and ease of administering the test worth the additional effort?

The first two questions relate to the clinical diagnosis, and are intended, in part, to help the clinician determine whether or not a diagnostic test is desirable. In turn, the answers to the last two ques-

tions will help the clinician to decide which test to employ.

Properties Of Diagnostic Tests

The traditional method of evaluating a new diagnostic test involves acquiring a sample of patients, some with the disease in question and some without. These two groups are selected using the current gold standard of diagnosis. All subjects are then exposed to the new diagnostic test. An individual, blinded to the actual disease status of the patients, determines which patients have the disease (positive test result) and which do not (negative test result). The results of this type of study are represented in **Table I**. In this table, "a" equals the number of known disease cases for which the results of the diagnostic test were positive, and "d" equals the number of non-diseased cases for which the test results were negative. These two values are called the true-positive and true-negative test results, respectively. The complement of these two values are the false-negative ("c") and false-positive ("b") fractions. That is, those cases which the diagnostic test incorrectly identified as being normal or diseased. The values found in this table can be used to calculate the accuracy, sensitivity, specificity and likelihood ratios^a associated with the diagnostic test. The calculation of the various measures of test performance are presented in **Table I**.

Test Accuracy

Test accuracy is a measure of the overall agreement between the diagnostic test and the gold standard. The more accurate the test, the fewer false-negative and false-positive results. Test accuracy does not distinguish between healthy and diseased individuals, or predict the probability of the presence or absence of disease based on the test results. For this we need to examine other properties of a diagnostic test.

Sensitivity

Sensitivity is the ability of the diagnostic test to show a positive result when disease is actually pre-

Table II

Calculation Of Cut-Off Points Using Positive Likelihood Ratios (adapted from Haffajee, et al. *J Clin Periodontol* 18:117-125, 1991).

% sites with PD > 3 mm	+ AL (subjects)	- AL (subjects)	+LR
1-5	17	120	0.38
6-15	22	49	1.20
16-30	15	25	1.25
31-100	20	3	18.00
Total	74	197	

PD = Pocket Depth (i.e. diagnostic test)

AL = Attachment Loss (i.e. gold standard determination of disease)

+LR = Positive Likelihood Ratio

Table III

Reported Properties For Toluidine Blue Dye Test

Test Characteristic	Mashberg 1980	Mashberg 1983	Silverman 1984
Sensitivity	0.86	0.91	0.97
Specificity	0.93	0.89	0.69
Positive Likelihood Ratio	12.70	8.90	3.20

sent. The more sensitive the test, the fewer diseased patients who will be identified as being well (false-negative).

Specificity

Specificity is the ability of the diagnostic test to show a negative result in healthy individuals. The more specific the test, the fewer non-diseased patients who will be identified by the diagnostic test as being sick (false-positive).

Sensitivity and specificity are typically presented together. They are generally expressed as proportions, with higher values denoting better performance. Ideally, a diagnostic test should be both highly sensitive and highly specific, but in reality this is rarely the case. It's an important fact to note. Depending on the particular application of a diagnostic test, the clinician may desire greater sensitivity at the expense of specificity, or vice versa. Tests known to be highly sensitive may be used to rule out the presence of a particular disease if the

results are negative, whereas tests demonstrating high specificity tests may be used to rule in a particular disease if the results are positive.

For example, dental caries diagnosis requires a very specific test to ensure that sound teeth are not needlessly subjected to restoration; even if it means that some early lesions may not be detected. On the other hand, if a patient with a compromised hemostatic mechanism is in need of a dental extraction, a very sensitive test (one with very few false-negative results) is required to determine the best timing for the procedure. In the latter case, a false-negative result (low sensitivity) could lead to a serious bleeding problem, whereas a false-positive result (low specificity) would only delay the extraction until a more complete blood work-up is done.

Likelihood Ratio

The likelihood ratio provides an indication of how many times

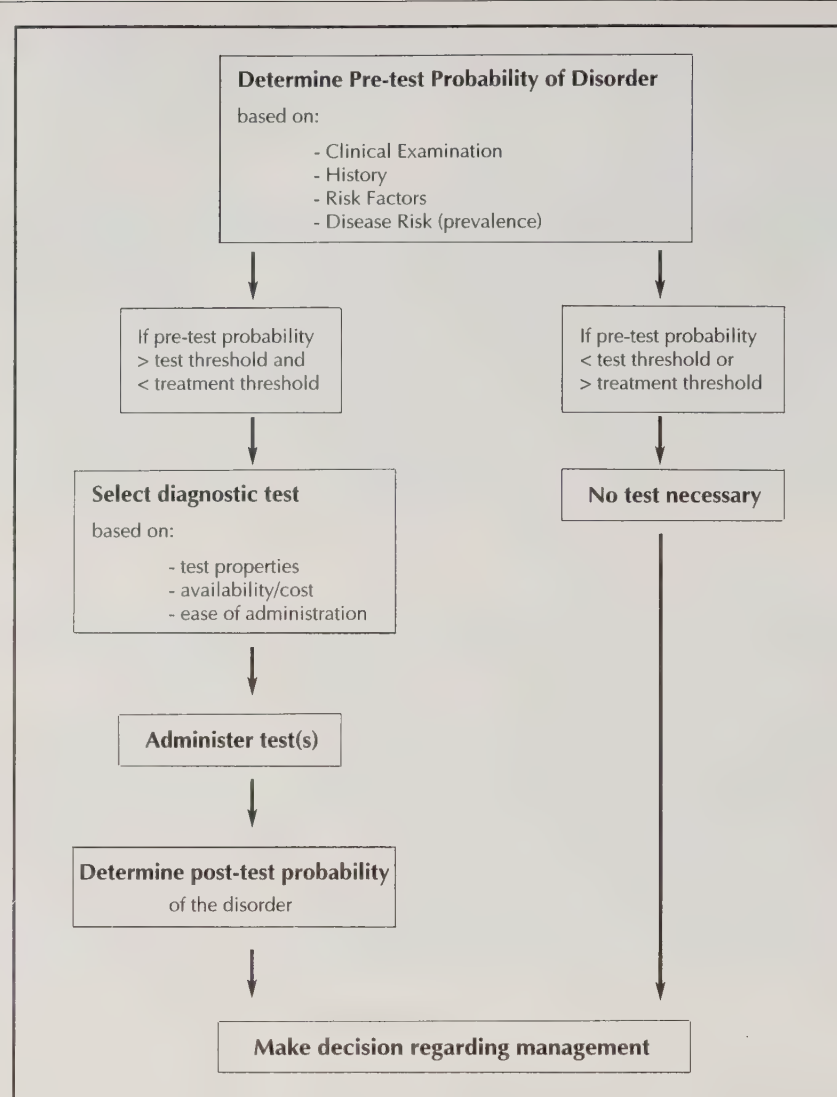


Fig. 1: Steps in the selection of a diagnostic test.

more likely it is that a given test result will occur in diseased as compared to non-diseased individuals. In effect, a positive likelihood ratio is the odds that a positive test result will occur in a diseased individual as compared to a non-diseased individual. Similarly, a negative likelihood ratio is the odds that a negative test result will occur in a healthy person as compared to a person with the disease. Therefore, a positive likelihood ratio of 8.5 means that a positive test result would be 8.5 times more likely to occur in a sick individual than a healthy one; while a negative likelihood ratio of 10 means that a negative test result would be 10 times as likely to come from a healthy individual as compared to one who has the disease.

One advantage of the use of likelihood ratios over sensitivity

and specificity is that they are unaffected by how common the disease is in the population (disease prevalence). Another advantage is that a range of odds can be determined for varying degrees of a positive test. That is, the likelihood ratio can be calculated for a slightly positive test result as well as for a strongly positive test result. This is exemplified in a study by Haffajee et al⁹ that examined the risk of future periodontal attachment loss based on the percentage of sites with pocket depths of greater than 3.0 mm in patients with adult periodontal disease (Table II). If five per cent of sites with pocket depths of greater than 3.0 mm were used as a cut-off to predict future attachment loss, the positive likelihood ratio is 0.38. On the other hand, if more than 30 per cent of sites show pocket depths of greater than 3.0 mm, the

likelihood ratio is 18. If this is the case, the clinician can inform the patient that, if left untreated, he or she is 18 times more likely to have continued periodontal breakdown, assuming more than one-third of the sites in his or her mouth already exhibit attachment loss.

More importantly, depending upon the results of the test, the clinician can use the likelihood ratio, along with the pre-test probability of the presence of disease based on his or her clinical findings, to determine a post-test probability that the disease is present. This post-test probability, in turn, can be considered as a new pre-test probability if more than one diagnostic test is used (i.e. serial testing), greatly enhancing the clinician's diagnostic accuracy.

The Decision To Test

Fig. 1 summarizes the procedure for determining when a diagnostic test should be used to assist with a clinical diagnosis. The decision to use a diagnostic test is not always intuitively obvious. There are three possible decisions that can be made, given that the probability of the presence of a disorder is known or can be estimated (pre-test probability): withhold treatment (observe), treat without testing, or use a diagnostic test prior to making a treatment decision.¹⁰

Probability Thresholds

While probability thresholds are not properties of a diagnostic test *per se*, they can assist with the decision making process.^{11,12} The test threshold indicates when, based on the probability that the disorder is present, the clinician should be indifferent with regards to performing a diagnostic test and observing the condition. In turn, the treatment threshold indicates the probability of the disorder at which the patient would be treated without further testing (Fig. 2).

Threshold levels are determined using the properties of the diagnostic test (i.e. accuracy, sensitivity, specificity), together with estimates of the probability of outcome based on the three possible courses of action and their associated risks or benefits. If the

pre-test probability of a disorder falls between the two thresholds, i.e. test or treat, an appropriate diagnostic test should be selected to assist the clinician in making a definitive diagnosis. The following clinical example demonstrates the use of clinical diagnosis, diagnostic test properties, and test probability thresholds to help clinicians decide whether or not to use toluidine blue as a diagnostic test.

A Clinical Example

A female patient, 60 years of age, with 23 natural teeth, generalized gingival recession, good oral hygiene and previous coronal caries experience, but no active caries at this time, presents herself at your office. She relates a smoking history of one pack a day for 30 years, and that she drinks about four ounces of alcohol per week. Visual examination reveals an irregular, 2.0 x 4.0 mm, flat, non-ulcerated, non-indurated, white plaque on the left floor of the mouth, which does not rub off. The patient is unaware of the lesion, and it was not present six months ago. You realize that this is a typical location for squamous cell carcinoma (SCC). The literature indicates that the incidence of oral carcinoma in females is about seven in 100,000.¹³

From these data, it seems that the odds are against this patient having SCC, but because of other risk factors, such as her age and history of smoking, you are not prepared to dismiss the lesion as insignificant. Firstly, smoking combined with alcohol use can increase the risk of SCC significantly. Secondly, most SCC is diagnosed in persons 60 years of age and over. Based on the location of the lesion, its clinical appearance, and the presence of the risk factors of age, smoking and alcohol use, you might increase the probability to 40 per cent. This is, of course, a best guess based on your clinical experience and the signs and symptoms. The perceived risk may vary between examiners.⁶ However, with this pre-test probability in mind, three possible decisions can be made:

1. the patient can be reassessed in seven to 10 days (observe);

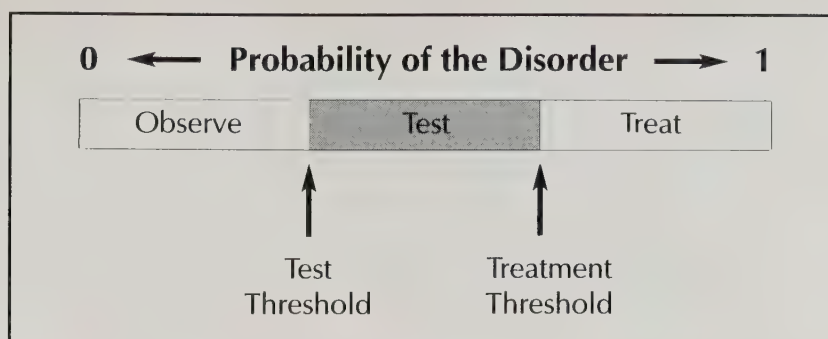


Fig. 2: Threshold probabilities of a diagnostic test.

CALCULATION OF POST-TEST PROBABILITIES

1. Convert pre-test probability to pre-test odds:

$$\text{Odds} = \text{Probability} / (1 - \text{probability})$$

E.g. Pre-test probability = 0.40

$$\text{Pre-test odds} = (0.40 / 0.60) = 0.67$$

2. Multiply pre-test odds by likelihood ratio:

$$\text{Pre-test odds} \times \text{LR} = \text{Post-test odds}$$

E.g. Pre-test odds = 0.67

$$\text{post-test odds} = 0.67 \times 3.2 = 2.14$$

3. Convert post-test odds to post-test probability:

$$\text{Probability} = \text{odds} / (1 + \text{odds})$$

E.g. Post-test odds = 2.14

$$\text{Post-test probability} = 2.14 / 3.14 = 0.68$$

Fig. 3: Calculation of post-test probabilities.

2. an excisional biopsy can be performed (treat); or
3. a diagnostic test such as a cytological smear or the toluidine blue test could be employed prior to deciding on a course of treatment (test).

You choose the third option.

The next step in your diagnostic decision-making process is to calculate the probability thresholds for the test you choose.¹¹ In the case of oral squamous cell carcinoma, the risk of administering a non-invasive diagnostic test such as toluidine blue dye would be negligible. Equally important, the risk of treating a patient without the disease is also estimated to be quite low (five per cent morbidity), and the benefit of treatment would be an increase in the relative survival rate of 48 per cent compared to patients in whom the cancer entails regional involvement.¹³ Thus,

the test threshold for toluidine blue dye is 0.05 and the treatment threshold is 0.48. Since the pre-test probability (0.40) that you determined from your clinical examination falls between the test and treatment thresholds for toluidine blue, the use of the test is indicated for this patient.

A less scientific, yet more pragmatic method of determining thresholds is to arbitrarily assign probabilities that reflect your comfort zone as a clinician. For example, many clinicians could be comfortable with a test threshold of 0.20 and a treatment threshold of 0.70. If the probability of a disorder is less than 20 per cent, you might be content to observe the situation. On the other hand, if the probability of a disorder exceeds 70 per cent, you would confidently initiate treatment. However, if the probability of disorder falls between 20 and 70 per cent,

SERIAL TESTING

1. Convert pre-test probability to pre-test odds:
(see Fig. 3)

E.g. Pre-test odds = 0.67

2. Multiply pre-test odds by likelihood ratio of first
(most sensitive) diagnostic test:
(see Fig. 3)

$\text{Pre-test odds} \times \text{LR \#1} = \text{Post-test odds \#1}$

E.g. Post-test odds = 2.14

3. Multiply post-test odds by likelihood ratio of second
diagnostic test:

$\text{Post-test odds \#1} \times \text{LR \#2} = \text{Post-test odds \#2}$

E.g. Post-test odds \#1 = 2.14

Post-test odds \#2 = 2.14 $\times$ 14.3 = 30.6

4. Convert post-test odds to post-test probability:
(see Fig. 3)

E.g. Post-test odds = 30.6

Post-test probability = 30.6/31.6 = 0.97

Fig. 4: Calculation of post-test probabilities using more than one diagnostic test.

it is difficult to know intuitively what course of action to take. In this case, additional information in the form of the results of a diagnostic test would be most helpful.

The toluidine blue dye test is differentiated on the basis of being positive or negative. When applied to a malignant lesion, a dark blue stain appears (positive result). Results from the literature show that toluidine blue performs extremely well as a diagnostic test (Table III).

From the reported data,³⁻⁵ the authors calculated sensitivity, specificity and likelihood ratios for toluidine blue. This test has a sensitivity of between 0.86 and 0.97. In other words, when no blue stain appears on the lesion, this negative test result will be wrong only three to 14 per cent of the time. The specificity of the test is reported to range from 0.69 to 0.93, indicating that the test will falsely identify non-malignant lesions as being malignant at a rate of between seven and 21 per cent.

While likelihood ratios are often associated with calculations of diagnostic test properties at different

levels of a test, they can also be used to establish the probability of the presence or absence of a lesion following the use of such a test (post-test probability) if the test results are simply positive or negative. The positive likelihood ratios for the toluidine blue test were calculated to be between 3.2 and 12.7. If toluidine blue dye is applied directly to the lesion, and a positive result (dark blue stain) appears, you can use the information from the test properties and your estimate of pre-test probability to determine the probability of the presence of SCC. Using the lowest calculated likelihood ratio of 3.2, the probability of malignant disease would increase to 0.68, from your previous pre-test estimate of 0.40, with a positive test result (Fig. 3). Using the highest likelihood ratio of 12.7, the post-test probability increases to 0.89. In other words, the use of the diagnostic test significantly increased the estimated probability of the lesion being malignant over clinical opinion alone.

Even higher post-test probability estimates could be obtained if a

second diagnostic test (serial testing) was employed. Serial testing leads to a more specific result, and is therefore very useful for ruling-in a clinical diagnosis.¹⁴ For example, if a positive cytology test with a sensitivity and specificity of 0.57 and 0.96, respectively, was determined for a patient, and a positive likelihood ratio of 14.3¹⁵ was also found, the probability of squamous cell carcinoma being present would be increased to 0.97 (Fig. 4). On the other hand, if there is a negative result (i.e. no stain or a light blue stain) when toluidine blue dye is applied directly to the suspicious area, the presence of SCC can be ruled out. This is because highly specific tests are rarely positive in the absence of disease (i.e. there are very few false-positive results).

With any diagnostic test, false-positive and false-negative results can occur. The clinician must always keep the particular properties of a diagnostic test in mind when interpreting the results. A diagnostic test should only be applied, and its results interpreted, if the clinician knows the strengths and weaknesses of the test being employed as well as the nature of the disease in question. In the case of toluidine blue dye, false-positive results are more likely to occur in areas of increased cellularity and chronic or aphthous ulceration, as well as in the presence of granulation tissue and hyperkeratosis. Filiform papillae, minor salivary glands, and fissures and crypts of the tongue also readily take up the dye.¹⁶⁻¹⁸

In the above clinical example, toluidine blue dye was used purposely as a diagnostic test and not for screening purposes. As a general screening tool, the dye may perform quite differently. Obviously, the test results must be interpreted with this knowledge in mind if the test is to be used appropriately.

Clearly, diagnostic tests can assist the clinician in making a difficult clinical diagnosis. However, their use and interpretation must be based on knowledge of the disease being considered, as well as how well the diagnostic test performs.

Thoughtless implementation of any diagnostic test can lead to misuse and misinterpretation of the results. One must not assume, just because the test is available, that it will be better than clinical judgment alone. Yet, used judiciously, supplemental clinical tests can help to reduce the level of uncertainty in the clinical decision-making process, and ultimately lead to earlier disease detection and reduce unnecessary treatment. ■

Dr. D.C. Matthews is an assistant professor in the division of periodontics, faculty of dentistry, University of Western Ontario.

Dr. D.W. Banting is a professor in the division of community dentistry, faculty of dentistry, University of Western Ontario.

Dr. R.N. Bohay is an assistant professor in the division of oral medicine and radiology, University of Western Ontario.

Reprint requests to: Dr. Debora C. Matthews, Faculty of Dentistry, University of Western Ontario, London, ON N6A 5C1.

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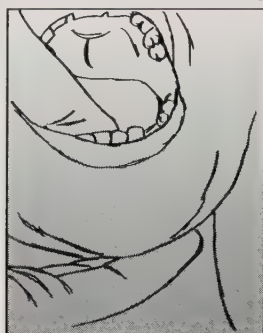
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ORAL CANCER



Cancer Of the Tongue

I.T. Leong, B.Sc., BDS

J.H.P. Main, BDS, PhD, FDSRCS, FRC Path., FRCD(C)

B.D. Birt, MB, BS, FRCS, FRCS(C)

ABSTRACT

Squamous cell carcinoma of the tongue is the most common intraoral malignancy. It may be preceded by visible precursor lesions showing hyperkeratosis, erythroplakia or a combination of these conditions. The clinical appearance is highly variable, and ranges from asymptomatic white patches to large fungating, infiltrating lesions. Earlier detection of squamous cell carcinoma of the tongue should improve survival rates for this malignancy, which have not appreciably increased over the past several decades. The oral cavity is an accessible site and the dentist has an important role to play in early detection.

SOMMAIRE

Un épithélioma malpighien spino-cellulaire à la langue est la malignité intrabuccale la plus commune. Il peut être précédé par une lésion visible qui l'annonce, montrant une hyperkératose, une érythroplasie ou les deux. Son apparence varie beaucoup, allant de plaques blanches asymptomatiques à de grandes lésions fongiformes et infiltrantes. Une détection plus précoce de cette affection à la langue devrait améliorer les taux de survie pour cette malignité, lesquels n'ont pas sensiblement

augmenté depuis plusieurs décennies. La cavité buccale est un endroit accessible, et le dentiste a un rôle vital à jouer pour détecter tôt cette affection dans la bouche.

Introduction

Squamous cell carcinoma (SCC) of the tongue is the most common intraoral malignancy in western countries.¹ The tongue may be affected by a number of other malignant neoplasms such as salivary adenocarcinoma, metastatic carcinoma, sarcomas and lymphomas, but these lesions are all very uncommon. Lingual carcinoma has a considerably higher incidence in India¹ where it is associated with the practice of pan chewing. Pan — or nass as it is called in southern Russia — is a variable mixture that usually contains tobacco, slaked lime, betel nut and other constituents.

Site

Carcinoma of the oral tongue is most commonly located on the lateral border and ventral surface of the tongue, where it merges into carcinoma of the floor of the mouth. The dorsum and tip of the tongue are seldom affected. The posterior third or base of tongue (BOT) — the portion posterior to the circumvallate papillae and incorporating the nodules of lym-

phoid tissue called the lingual tonsil — accounts for up to one-third of all SCCs of the tongue in some series.²

Age and Sex

Tongue cancer is most common in males from the sixth decade onward, although lesions may be found in persons under the age of 40.³ Men and women are almost equally affected in some of the ethnic groups in Singapore and Hawaii, however.¹

Incidence

In 1992, the age-standardised and cumulative incidence of tongue cancer for Canadian men was 2.2 per 100,000, and for Canadian women 0.8 per 100,000.¹ There is some variation in these rates among the 10 provinces, with the highest rates for men being found in Quebec (2.8 per 100,000) followed by Ontario (2.4 per 100,000). For women, the highest rates were found in British Columbia (1.1 per 100,000) and Ontario (0.9 per 100,000).¹ These figures are in contrast to the very high age-standardised and cumulative incidence of tongue cancer in men in certain parts of India (14.0 per 100,000 in Ahmedabad and 7.4 per 100,000 in Bombay) and certain regions of France (10.2 per 100,000 in Bas Rhin, 7.1 per 100,000 in Doubs, and 6.7 per



Fig. 1: SCC presenting clinically in a 43-year-old female as hyperkeratotic patches on the lateral and ventral borders of the tongue with a small area of erythema/erosion.

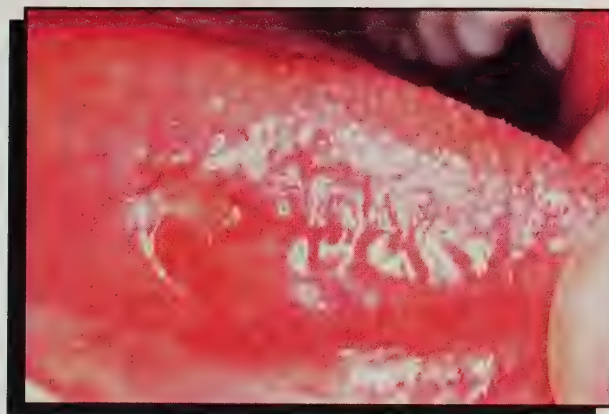


Fig. 2: SCC of the tongue presenting clinically in a 31-year-old female as a mildly erythematous patch.

100,000 in Calvados).¹ A rising trend in tongue cancer incidence, particularly among younger men, has been shown in many western countries, including the United States,⁴ Scotland⁵ and Denmark.⁶

Clinical Features

Premalignant Lesions

The majority of oral cancers are believed to be preceded by a clinically detectable precursor lesion, either hyperkeratosis, erythroplakia or a combination of these conditions.

The generally quoted figure for the malignant transformation of hyperkeratosis in the western world is three to six per cent over 10 years.^{7,8} This varies depending on the degree of epithelial dysplasia present, however, with neoplastic change being much more frequent in severe dysplasia. There are two clinical types of hyperkeratosis: homogeneous and non-homogeneous. Hyperkeratosis is a dynamic rather than a static process, and is capable of continuous clinical and histologic change. Some lesions spontaneously regress, while others spread and evolve from a homogeneous to a nonhomogeneous lesion. The nonhomogeneous form is much more likely to show severe dysplasia.

Hyperkeratosis is a clinical condition and may represent a variety of pathologic changes microscopically. Under the microscope, most hyperkeratotic lesions are characterised by varying degrees of hyperorthokeratosis, hyperparak-

eratosis, and acanthosis. Some are dysplastic. It is impossible to predict from clinical inspection alone which lesions will show dysplasia and which will not.

In dysplasia of the squamous epithelium, the normal maturation of the tissue is disrupted. Epithelial dysplasia is accepted as the histological precursor of squamous cell cancer, and it is generally assumed that malignant transformation is histologically characterised by the progression from normal epithelium through increasingly severe dysplastic changes to carcinoma-in-situ, and ultimately to invasive carcinoma. However, dysplasia must be regarded only as a potentially malignant process because not all dysplastic lesions progress to malignancy. Some regress, some remain unchanged for years, and others progress to carcinoma rapidly.

Both the anatomic site and the clinical type of hyperkeratosis influence the malignant potential. The ventrum and lateral tongue borders (together with the floor of the mouth) are high risk sites, while erythroleukoplakia, nodular or speckled leukoplakia (non-homogeneous forms), and verrucous hyperkeratoses are significantly more likely to be dysplastic or invasive than are homogeneous hyperkeratoses (**Fig. 1**).⁷ Despite the association of tobacco with oral carcinoma, the idiopathic hyperkeratoses have a higher risk of malignant transformation than those that are tobacco-associated.⁸

Erythroplakic lesions are less common than hyperkeratoses, but are more ominous because they have greater potential for carcinomatous change. Some lesions are velvety smooth or granular, while others are interspersed with hyperkeratotic patches or nodules. They may be asymptomatic, although some patients experience discomfort with hot and spicy foods. Up to 85 per cent of cases of erythroplasia have shown significant dysplasia or frank malignancy.⁸

Malignant Lesions

The clinical appearances of SCC are highly variable and can be deceptively innocuous. Some cancers present as ulcers, others as red or white areas, and others as lumps or fissuring (**Figs. 2, 3** and **4**). Some tongue cancers are asymptomatic, arising in an atrophic depapillated area with erythroplakia or with peripheral streaks or areas of keratosis. Later tongue cancer may manifest as an exophytic lesion, ulcer or area of superficial ulceration with induration. A typical malignant ulcer, which is hard with heaped-up and often everted or rolled edges, and has a granular indurated floor, may develop. There may be fixation to the deeper tissues. As the tumor infiltrates the tongue, there may be deviation of the tongue on protrusion as well as pain and difficulty with speech and swallowing. Slight difficulty in clear speech is often an early symptom. Patients with SCC of the BOT may



Fig. 3: SCC of the tongue presenting clinically in a 74-year-old male as patches of spotty hyperkeratosis alternating with slightly depressed erythematous areas (erythroleukoplakia).

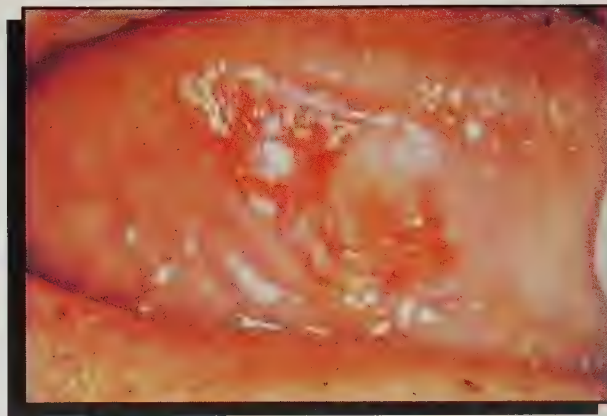


Fig. 4: SCC of the tongue presenting clinically in an elderly male as an erythematous patch with spotty hyperkeratosis and ulceration.

present with the primary complaint of persistent sore throat, sometimes in the form of odynophagia or glosso-pharyngeal neuralgia, or they may present with referred otalgia. Palpation of the BOT is important in the early detection of SCC of the BOT. Indirect laryngoscopy and flexible endoscopy are usually required to see the lesion.

Patients with cancer of the oral tongue may have palpable cervical lymph nodes at presentation. Enlarged lymph nodes may be caused not only by metastatic disease, but also by secondary infection of the tumor resulting in reactive lymphoid hyperplasia. In general, metastatic deposits from SCC of the tongue are found in the ipsilateral lymph nodes of the neck, usually in the submandibular or jugulodigastric groups at the angle of the mandible. Uncommonly, metastatic deposits may occur in the lung or liver.

There is a high incidence of cervical metastases in SCC of the BOT, with 60 per cent or more of patients having ipsilateral nodal disease at the time of initial presentation. Up to 20 per cent of patients have bilateral disease. The relatively rich lymphatic network in this area, the tendency of these lymphatic channels to drain to both sides of the neck, and delays in the detection of inconspicuous tumors that are not directly visible, all increase the chance for nodal metastasis to occur. The commonly involved nodes are in the

subdigastric and midjugular groups.²

Etiology

Tobacco and alcohol are regarded as the most important etiological factors in the development of intraoral SCC. Because a combination of tobacco and alcohol is often used, it is difficult to distinguish the separate effects of these agents. Smoking and alcohol may, therefore, have a synergistic effect.⁸⁻¹¹ All forms of smoking, as well as the use of pan, have been linked to the development of oral cancer.¹² The carcinogenic effects of alcohol and tobacco are dose- and time-related.¹¹

Possible carcinogens may exist in the form of contaminants or congeners in alcoholic beverages.¹³ It has been suggested that the mechanism by which alcohol might promote carcinogenesis is through a localised solvent action.¹¹ Alternatively or additionally, the alcohol-compromised liver may have a decreased ability to detoxify potential carcinogens.¹⁴ The increased risk of oral cancer associated with regular use of a mouthwash could be related to the alcohol concentration of the mouthwash.¹⁵

Chronic neglect of the teeth and periodontal tissues is not considered to be an important predisposing factor in the development of oral cancer. The oral soft tissues are exposed to many chronic microbiological and mechanical irritants, but an association between these factors and oral cancer has

never been shown. Current concepts are that local irritation may act as a localising and perhaps triggering factor, but is not a primary cause.

The Plummer-Vincent (Patterson-Kelly) syndrome, or sideropenic dysphagia — a condition comprising iron-deficiency anemia, achlorhydria and glossitis — is associated with the development of single or multiple oral, pharyngeal and oesophageal cancers in women.¹⁶ However, in most reported series the proportion of subjects with such a history is small.

The immune system may influence the development of a malignancy, but it is not clearly understood whether a neoplasm develops because of a lack of recognition mechanisms or because of a failure in immune response. Oral cancer is an age-related disease, and since aging is associated with reduced cell-mediated immune activity, it has been suggested that the increasing incidence of cancer with age is due to impaired immune response. Furthermore, several putative carcinogenic factors such as smoking, alcohol and iron deficiency have been shown to reduce cell-mediated activity. Radiation therapy also decreases immune reactivity, which may account in part for the increased incidence of second primary carcinomas in radiated patients.¹¹ The incidence rate of malignant disease is more than 100 times higher in patients with a primary immunodeficiency than in

the general population, but there is no evidence of increased risk of oral SCC. The magnitude of risk of developing intraoral carcinomas with chronic, iatrogenic immunosuppression also appears relatively small.^{8,11} The most common intraoral malignancies in AIDS are Kaposi's sarcoma and lymphoma, although carcinoma has been reported.¹⁷

There is a strong association between cancer of the tongue and tertiary syphilis, but this does not necessarily infer that syphilis is a causative factor in lingual cancer. The substances used to treat syphilis before the advent of suitable antibiotics, i.e. various preparations of arsenicals and heavy metals, may have been the carcinogenic agents rather than the infection itself. Tertiary syphilis is now very rare, and it is therefore unlikely that more conclusive epidemiological evidence linking the two diseases will emerge.

Oral submucous fibrosis is a chronic disease of oropharyngeal mucosa, chiefly affecting the cheeks and soft palate. It is characterised by inflammation and a progressive fibrosis of the lamina propria associated with epithelial atrophy and, not uncommonly, epithelial dysplasia. This disease occurs almost exclusively in South East Asia in association with pan use,⁷ but does not commonly affect the tongue.

The malignant potential of erosive lichen planus is controversial. Many of the previously reported cases of malignant transformation in lichen planus most likely represent cases of malignant transformation of dysplastic lesions bearing some histological similarity to lichen that were misdiagnosed. Lichen planus is a common mucosal condition, and some of these patients will develop oral cancer by chance alone. There may be an association between lichen planus and the subsequent development of oral cancer, but the magnitude of this risk is unknown and not large.⁷

It is also not clear whether chronic candidiasis *per se* is a precancerous condition, as has been suggested by Cawson and Binnie,¹⁸ or whether the presence of candida

in dysplastic lesions represents superinfection of those lesions.

In human oral cancer, evidence of herpes simplex virus (HSV) may or may not have significance. HSV is a commonly found virus. As such, its presence in oral cancer does not prove a causal association with the tumor.¹⁹

Evidence of human papilloma virus (HPV) infection has been found in biopsies from oral cancer and precancer, as well as in apparently normal mucosa. Its role in oral carcinogenesis is therefore uncertain.^{20,21} HPV contains genes that are expressed early during viral replication, termed E genes, which can interact with the mechanisms controlling cell growth and differentiation. Whether these genes play a role in oral cancer has yet to be proved.¹⁹

Survival and Mortality

There has been no dramatic change in the five-year survival rate for cancer of the tongue over the past several decades. The stage at which the disease is treated is the single most important factor affecting survival. Nyman et al²² found the five-year survival rate in a series of patients with neck nodal involvement to be 11 per cent, as compared to 50 per cent for those without nodal involvement. Five-year survival rates for all stages of cancer of the tongue combined differ depending on the population studied and the treatment modalities of different institutions. Recent figures range from 11 to 65 per cent.²²⁻²⁴ Time is required to draw adequate conclusions on the influence that changes in treatment methods have on survival rates, but a significant increase in survival rate has been reported with more aggressive treatment of the neck.²³

There were 233 deaths attributed to tongue cancer in Canada in 1991; 163 in men and 70 in women.²⁵

Diagnosis

Early diagnosis of tongue cancer relies on a high index of clinical suspicion and, since the clinical appearance is so variable, on clinical experience. Definitive diagnosis is achieved by biopsy of the lesion. The practical clinical approach to any suspicious oral le-

sion should include a thorough search for possible local causative factors such as tooth or denture irritation or a tongue rubbing habit. Any such factors should then be eliminated. If there has been no regression in the lesion after two weeks, then a biopsy of the lesion is mandatory.

Lesions of irritational origin should resolve in one to two weeks once the inciting cause has been removed. Since red rather than white areas are most likely to show dysplasia, a tissue sample from a red area should always be included in the biopsy if both red and white lesions are present. If the lesion appears obviously malignant, then immediate referral to a cancer treatment centre is the most appropriate course of action. This avoids unnecessary delay and allows examination of the primary lesion in an untouched state.

The role of exfoliative cytology in the evaluation of premalignant and malignant oral lesions is very limited. Cytologic diagnosis only detects superficial suspicious cells and cannot render a definitive diagnosis. If a cytologic smear is reported as positive, biopsy is still required. Toluidine blue has been advocated as an adjunct to the clinical evaluation of oral lesions based on its ability to detect increased nuclear activity in dysplastic or carcinomatous surface lesions. However, both false-positives and false-negatives occur,^{7,26,27} and its usefulness is limited.

Staging

Clinical staging allows for assessment of the extent to which the disease has progressed in each individual patient. Clinicians can then provide meaningful prognostic information to the patient, and compare treatment results using different modalities. The TNM system, where T is a measure of the primary tumor size, N is an estimation of the regional lymph node metastasis, and M is a determination of distant metastasis, is commonly used.

Management

The aims of treatment of SCC of the tongue are to ensure survival and to preserve good function for

speaking and eating. Many different health-care providers are involved in the integrated management of the oral cancer patient, including the head and neck surgeon, oral surgeon, radiation oncologist, pathologist, dentist and speech therapist. The patient's general medical, dental and psychological status must be taken into consideration before, during and after definitive cancer therapy. Generally, oral cancers are treated by surgery or radiation, or both. Smaller lesions are usually treated by surgery alone, with radiation used as a backup in the event of recurrence. The factors that determine which approach should be used include lesion location, histologic type, institution facilities and philosophy, referral patterns, and therapist skills. Larger lesions may be treated by either modality or by surgery followed by radiation. Elective or prophylactic neck dissection is advocated by many providers in order to eliminate subclinical or occult metastases. Oral SCCs are generally resistant to chemotherapeutic measures, and chemotherapy is used only as adjunctive therapy in advanced cases.

The Role Of the Dentist

The roles of the dentist in the management of patients with cancer of the tongue include early detection of precancer and cancer, appropriate referral, maintenance of optimal oral health before, during and after treatment, management of treatment-associated complications, such as radiation mucositis, xerostomia and radiation caries, as well as continual evaluation for recurrence or the development of other primary malignancies.

Dentists who fail to detect oral cancer may be subject to allegations of malpractice. While the Canadian dental malpractice experience differs significantly from that in the United States, there have been several successfully litigated suits against dentists in the U.S. for their failure to detect oral cancer.²⁸ ■

Dr. Leong is a resident in oral pathology, department of dentistry, Sunnybrook Health Science Centre, University of Toronto.

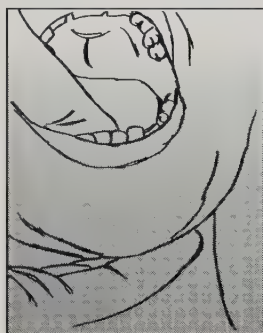
Dr. Main is a professor and head, department of oral pathology, faculty of dentistry, University of Toronto, and head, department of dentistry, Sunnybrook Health Science Centre, University of Toronto.

Dr. Birt is a head and neck surgeon in the department of otolaryngology, Sunnybrook Health Science Centre, University of Toronto and Toronto Sunnybrook Regional Cancer Centre.

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ORAL CANCER



Verrucous Carcinoma Of the Mouth

Richard C.K. Jordan, DDS, Dip. O. Path., M.Sc., PhD, FRCD(C)

Introduction

A number of diseases appear in the mouth as white lesions. Whilst the differential diagnosis is large, and includes a number of inflammatory and immunologic disorders, oral cancer is paramount for consideration. Accounting for more than 90 per cent of all malignant neoplasms of the mouth and oropharynx, squamous cell carcinoma is of particular concern because of its relatively high prevalence and its associated high morbidity and mortality.¹

One type of oral cancer, verrucous carcinoma, has a particular clinical appearance, histopathology and clinical course. Moreover, the biology of this tumor has significant implications for patient management and long-term prognosis. This article will review verrucous carcinoma and discuss its importance in light of recent advances in our understanding of its biological behavior.

Historical Aspects

In 1941, Fridell and Rosenthal² reported eight cases of squamous cell carcinoma of the buccal mucosa and mandibular alveolar ridge. The clinical appearance of four of these lesions was described as papillary or verrucous (warty). Microscopically, two of them were

reported as papillary squamous cell carcinoma.

Seven years later, Ackerman³ described 31 slowly growing, locally invasive carcinomas occurring predominantly on the buccal mucosae and mandibular gingivae in a group of elderly patients. These tumors shared a number of clinical and histological features, and Ackerman proposed the term *verrucous carcinoma* to define the condition. Since then a number of authors have corroborated Ackerman's original description,⁴⁻⁸ and have reported the condition at sites outside the oral cavity including the larynx,^{9,10} skin,¹¹ bladder,¹² oesophagus,¹³ and nasal fossa.⁴ When verrucous carcinoma occurs in the anogenital region, it is referred to as the Buschke-Lowenstein tumor.^{3,14}

Clinical Features

The most common site for verrucous carcinoma is the mouth.⁴ This tumor comprises between two and nine per cent of all carcinomas of the oral cavity,^{6,15,16} and a similar proportion of all laryngeal carcinomas.⁵ Most patients with verrucous carcinoma are older than 50, although the condition has also been reported in younger individuals.^{5,8} Men are more often afflicted than women,^{3-5,8} but two studies have described a female predominance.^{6,17} Many patients with verrucous carcinoma are re-

ported to chew tobacco, but this association is not consistent, and cases occur in patients with no history of tobacco usage.^{6,16} Verrucous carcinoma most commonly presents on the buccal mucosa or mandibular gingiva, although it can also occur at other intraoral sites.⁶ The clinical appearance depends on a number of factors including the duration of the lesion, the degree of keratinisation and presence or absence of changes in the adjacent mucosa.¹⁸ In its most common form the tumor presents as a non-ulcerated white growth with a papillary or warty surface (**Fig. 1**). Although it occurs less frequently, this roughened or pebbly surface may be inconspicuous, and the tumor can present as a flattened white lesion. Ulceration occasionally occurs centrally, but more typical verrucous or white areas can be identified peripherally.⁸

The tumor can vary in size from a small patch to an extensive, confluent mass affecting contiguous anatomic areas (**Fig. 2**).^{3,6} When the tumor arises on the buccal mucosa, it often extends on to the mandibular alveolar ridge. It can superficially invade the soft tissues overlying the mandible and become fixed to the periosteum. With continued growth, the tumor can invade and destroy the mandible, although this is a late development.¹⁹

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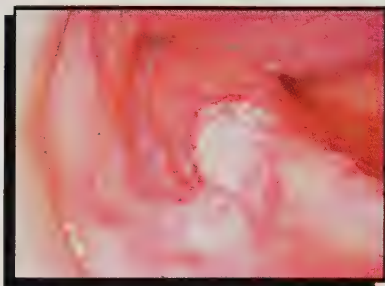


Fig. 1: A 76-year-old man presented with a white, warty growth on the maxillary alveolar ridge. It was diagnosed by biopsy as a verrucous carcinoma and surgically excised. Over a subsequent nine-year period he developed a number of recurrences which were all treated by surgical excision. The most recent recurrence was diagnosed as a squamous cell carcinoma.

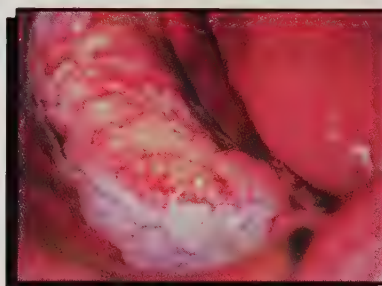


Fig. 2: An 84-year-old man presented with an extensive, exophytic, red and white lesion of the mandibular alveolar ridge. It was diagnosed by biopsy as a verrucous carcinoma and resected surgically. There have been no recurrences.

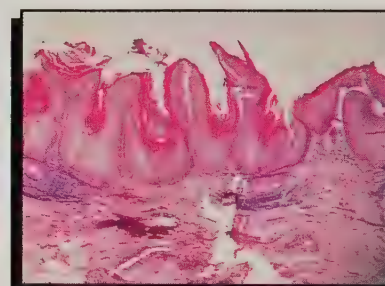


Fig. 3: A histological section of a verrucous carcinoma showing hyperkeratosis, epithelial thickening with a verrucous surface, and bulbous rete processes infiltrating the connective tissue, which contains an infiltrate of chronic inflammatory cells. (H & E 2.5X)

Lymph node enlargement in the neck may occasionally be detected at presentation, but this is usually due to inflammation. The enlarged lymph nodes rarely contain tumors.^{5,20} Verrucous carcinoma characteristically exhibits slow, persistent local growth, with metastasis to distant sites being exceedingly rare.^{16,18}

Histopathology

The histological criteria of verrucous carcinoma include the proliferation of hyperkeratotic, thickened epithelium with a papillary or verrucous surface. Clefts in the surface epithelium are filled with keratin. There is a downward proliferation of broad bulbous rete processes into the underlying connective tissue, nearly all at the same level, giving the impression of a "pushing border" (Fig. 3).^{3,17} The basement membrane appears intact, with little evidence of connective tissue invasion by individual tumor cells.

Verrucous carcinoma is well-differentiated, with minimal or no dysplasia.⁶ Mitoses are also infrequent and are localised to regions adjacent to the invasive front. Vacuolated cells reminiscent of papilloma-virus-infected epithelial cells can be identified in a large proportion of tumors.¹⁶ There is a dense infiltrate of chronic inflammatory cells in the underlying connective tissue, which are predominantly lymphocytes. Occasionally, the inflammatory infiltrate can be

so dense that it obscures the epithelial-connective tissue interface.

As highlighted by Ackerman,³ errors in histopathological diagnosis can occur. This usually results from sampling artefact. It is important for the clinician to take a biopsy that is both deep and large enough to allow the pathologist to examine the relationship between the tumor and the underlying connective tissue. Biopsies taken from the edge of the lesion permit histological evaluation of the transition between normal and neoplastic epithelium. Occasionally, multiple or repeat biopsies may be needed to diagnose verrucous carcinoma, hence the clinician must maintain a high level of suspicion for the condition even in the presence of an equivocal pathology report.

Etiology

Although a number of agents have been suspected to be important in the development of verrucous carcinoma, the etiology of this tumor remains unclear. Many reports have stressed the relationship of smokeless tobacco use with verrucous carcinoma,^{3,4,15} but this association is not consistent, and the tumor may develop in patients who do not use snuff or chewing tobacco.^{5,6,16} Furthermore, many of the reports of oral verrucous carcinoma developing in users of snuff or chewing tobacco fail to stress other tobacco and alcohol habits, i.e. many pa-

tients who chew tobacco products also smoke tobacco and drink alcohol. Tobacco smoking coupled with excess alcohol intake are known to be risk factors for the development of squamous cell carcinoma of the mouth, and they may play a role in the pathogenesis of oral verrucous carcinoma.²¹

The histological and cytological features of verrucous carcinoma have led some investigators to suspect the possibility of viral infection in the development of the tumor. Eisenberg et al¹⁶ examined 17 verrucous carcinomas and identified 15 cases that exhibited cytological features suggestive of viral infection. The morphological features of these tumors and their similarity to virally-infected epithelial lesions at other sites suggested the possibility of human papilloma virus (HPV) infection. This group of viruses, composed of at least 50 sub-types, has been associated with a number of human diseases including cutaneous warts, laryngeal papillomas and dysplasia of the uterine cervix.²²⁻²⁴

Because HPV infection is often latent in infected tissues, the identification of viral particles by conventional histological and immunological staining can be difficult. To overcome this, a number of investigators have attempted to identify HPV genes (DNA) in oral verrucous carcinoma. *In situ* hybridisation methods allow the DNA or RNA of potential viral and microbial pathogens in human tis-

sues and tumors to be identified. Using this technique, HPV DNA has only been found in 0 to 29 per cent of oral verrucous carcinomas.²⁵⁻²⁷ One of the technique's principal limitations is a low detection rate, however, especially when there are few copies of the viral genes in the infected host cell. A more sensitive technique is the polymerase chain reaction (PCR) test, which can amplify and identify very small amounts of specific DNA in minute fragments of tissue.

Two small studies that examined oral verrucous carcinoma for HPV DNA using PCR identified viral genes in 0 to 41 per cent of tumors.^{27,28} These results suggest that HPV infection is either an opportunistic "passenger" in some oral verrucous carcinomas, or that it is important in the pathogenesis of a select subset of tumors. The study also raises the possibility that other subtypes of HPV, not specifically examined, may contribute to the disease. Further research on oral verrucous carcinomas is clearly needed to study HPV and its relationship to the development of verrucous carcinoma.

Clinical Course and Biology

Many patients with oral verrucous carcinoma have extensive, long-standing, slowly-growing disease at the time of presentation. The lesion may also present as a rapidly-growing mass in a pre-existing white lesion, but this is less common. The well-characterised features of fully-developed verrucous carcinoma are in marked contrast to our understanding of the earliest forms of the disease.

Like other epithelial malignancies, verrucous carcinoma is believed to develop through progressive growth of antecedent precursor lesions. In its earliest stages, verrucous carcinoma may be unrecognised or confused with other white lesions. The term verrucous hyperplasia was introduced by Shear and Pindborg²⁹ to describe a lesion that resembles verrucous carcinoma and is now thought to be a precursor to it. This condition typically presents in a

similar intraoral distribution to verrucous carcinoma, in a similar age group, and has a strikingly similar clinical appearance. Moreover, in Shear and Pindborg's original series of 68 patients with verrucous hyperplasia, 20 had co-existent verrucous carcinoma. In seven others, verrucous hyperplasia was associated with squamous cell carcinoma.

Although histological criteria exist to distinguish and identify verrucous hyperplasia, some authors consider this condition to be an irreversible, early, evolutionary stage of verrucous carcinoma.¹⁹

Hansen et al³⁰ described a white lesion of the mouth that was slowly growing, persistent and progressive in a group of 30 patients, and called the condition proliferative verrucous leukoplakia (PVL). The lesions began as simple hyperkeratosis that spread to other sites and became multifocal. With time, the lesions became exophytic and developed a warty or papillary surface. In some cases, the condition evolved into an ulcerating, red and white lesion. Ten histological stages were identified in the spectrum of PVL, consisting of normal mucosa, hyperkeratosis, verrucous hyperplasia, verrucous carcinoma, papillary squamous cell carcinoma and less differentiated squamous cell carcinoma. Most of the lesions progressed slowly through the spectrum of PVL, with few lesions reverting to a lower stage. As such, the diagnosis of PVL can only be made retrospectively in patients having one of the stages described in the spectrum and a proven history of an antecedent intraoral white lesion.

PVL presents an attractive hypothesis to account for the natural history of many cases of verrucous carcinoma. It not only provides an interesting rationale for the persistent and progressive growth of verrucous carcinoma, it also relates the condition to lesions such as verrucous hyperplasia. Furthermore, it conceptually supports the histological association of verrucous carcinoma with less differentiated and potentially more aggres-

sive carcinomas.³¹ Whether all verrucous carcinomas are a component of PVL, and whether they all evolve as described, has yet to be determined.¹⁹ Only a few reports describe PVL, and more studies are needed to better characterise this concept.

Treatment

The two principal modalities used to treat verrucous carcinoma of the mouth are surgical excision and radiation therapy. Chemotherapy generally does not play a significant role.

Surgical excision is recommended by a number of authors as the treatment of choice.^{3,5,7,8,16} The surgery involves wide excision of the primary lesion and surrounding tissues, including bone and muscle, when invasion is suspected. Surgical dissection of the neck for lymph nodes is rarely performed unless there is a high clinical suspicion of tumor involvement. Successful control of the tumor using primary surgical excision varies, with recurrence rates ranging from 0 to 18 per cent.^{8,16,31} For patients who develop recurrences or those who develop tumors at other intraoral sites, surgical re-treatment can be undertaken.

Radiation therapy has also been employed in a number of series to treat verrucous carcinoma.^{3,5,8,15,32} One advantage of this technique is that a wide field can be treated, especially in cases where the disease is extensive and surgery could be severely mutilating. The potential complications of radiation therapy for oral tumors include mucositis, xerostomia, rampant dental caries, and the long-term risk of osteo-radionecrosis of the jaws. Although verrucous carcinoma is reported to be radiosensitive, recurrence rates and failure to control the disease using this treatment modality are generally higher than with surgical excision.^{3,8,15,31,32} Furthermore, radiation therapy is usually not repeated and recurrences must be managed surgically.

A controversial complication that may occur when radiation therapy is used to treat verrucous carcinoma is the development of



an aggressive, poorly differentiated carcinoma. The incidence of anaplastic transformation of verrucous carcinoma following radiotherapy varies from 0 to 30 per cent.^{3-5,8,9,32,33} In most reports, this transformation occurs within a short interval following radiotherapy, typically less than six months. The small numbers of patients, few and unrandomized series, differences in radiation therapy protocols, and varying inclusion criteria for verrucous carcinoma make comparisons between series somewhat difficult. It is therefore difficult to state conclusively how frequently this phenomenon occurs. However, inconsistencies in the case reports, coupled with multiple reporting of the same cases in different series, further suggests that it is relatively rare.³¹ Moreover, the development of well differentiated squamous cell carcinoma³⁴ or anaplastic carcinoma³¹ may be a property of the tumor and not a consequence of the therapy. Clearly, treatment decisions regarding the use of radiation therapy or surgery should be not be predicated solely on histological diagnosis, but should also take into account a number of clinical and pathological factors including the site, grade and stage of tumor, as well as the effectiveness of therapy and its potential complications.³⁵ Many of these factors may indicate that radiotherapy is the treatment of choice for verrucous carcinoma. To exclude it as a viable treatment alternate because of the possibility of a relatively uncommon phenomenon would seem to be inappropriate.¹⁸

Summary and Conclusions

Verrucous carcinoma is a slow-growing, well differentiated carcinoma that is chiefly exophytic but can invade and destroy oral tissues. It typically presents as an extensive, white, warty lesion of the buccal mucosa or mandibular gingiva, although it also occurs at other sites. Diagnosis can be difficult, with repeat biopsies being needed in some cases. The persistent nature of the condition can make management difficult and the possibility of recurrent disease is high. ■

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Dr. Jordan is an oral pathologist at Sunnybrook Health Sciences Centre and assistant professor at the faculty of dentistry, University of Toronto.

Reprint requests to: Dr. Richard Jordan, Department of Dentistry, H-126, Sunnybrook Health Sciences Centre, 2075 Bayview Ave. Toronto, Ontario. M4N 3M5.

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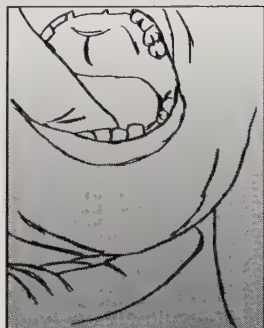


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LES CANCERS DE LA BOUCHE



La glossite bénigne migratoire: une lésion énigmatique

Nancy Beaudoin, DMD

Kevork Manoukian, DMD

Benoît Lalonde, DMD, MSD

SOMMAIRE

Malgré le fait que la glossite bénigne migratoire, communément appelée langue géographique, soit fréquemment observée, aucune étiologie précise n'a pu être confirmée jusqu'à présent. Étant de façon caractéristique asymptomatique, il n'est toutefois pas rare que l'observation de cette lésion par le patient suscite de l'inquiétude, compte tenu de son aspect spectaculaire. Une revue de la littérature fut complétée et les différentes hypothèses tant qu'à son étiologie qu'aux modalités thérapeutiques sont discutées.

ABSTRACT

Although benign migratory glossitis, commonly called "geographic tongue," is frequently observed, we still have not been able to determine its etiology. While the condition is usually asymptomatic, the spectacular appearance of the lesion frequently causes the patient considerable worry. Based on a review of the literature, different theories on the lesion's etiology as well as therapeutic modalities will be discussed.

Introduction

La glossite bénigne migratoire a été décrite pour la première fois par Rayer en 1831.¹ Depuis ce temps, plusieurs

autres noms ont été employés dont entre autres «langue géographique», «glossite exfoliatrice marginée», «état tigre de la langue», «exfoliation en aires de la langue», «exfoliato aearta linguae».²

Cette pathologie suscite auprès des patients suffisamment d'inquiétudes pour que ces derniers consultent leur dentiste ou leur médecin. Règle générale, les professionnels de la santé diagnostiquent facilement la glossite bénigne migratoire. Par contre, lorsqu'il s'agit d'informer leurs patients au sujet de l'étiologie et des traitements, l'information disponible est toutefois limitée.

Aspect clinique

De façon caractéristique, les lésions de la glossite bénigne migratoire sont annulaires et possèdent une bordure surélevée blanchâtre ou jaunâtre, qui correspond à un épithélium en voie de desquamation. Le centre de la lésion révèle une perte des papilles filiformes qui, éventuellement, reprendront leur aspect normal au fur et à mesure que la lésion se déplacera, d'où le nom de glossite bénigne migratoire. Les papilles fongiformes intactes se présentent sous forme de papules rouges dans cette zone centrale dénudée. Ces lésions, souvent multiples, se situent habituellement dans la portion latéro-dor-

sale de la langue et possèdent une dimension variant de 0,5 à 5,0 cm de diamètre (**Fig. 1**).³ Les changements caractéristiques de forme et de localisation s'observent durant la phase active de la maladie et peuvent persister de quelques jours à quelques mois. Celle-ci est suivie par la phase de rémission durant laquelle on n'observe aucun signe ou symptôme et dont la durée peut varier de quelques jours à plusieurs années. Ce phénomène «activation-rémission» semble cependant chronique.³

Hume² suggère une classification des atteintes buccales en quatre types:

Type 1 : Les lésions de formes annulaires accompagnées de plaques dénudées atteignant la surface dorsale, les bords latéraux ainsi que sur le bout de la langue. Les lésions migrent avec le temps et montrent les deux phases : active et de rémission. Aucune autre lésion n'apparaît ailleurs en bouche. La forme la plus caractéristique.

Type 2 : Le tableau clinique usuel de la glossite (Type 1) est présent et s'accompagne par d'autres lésions au niveau de la cavité buccale.

Type 3 : Les lésions retrouvées sur la langue ne sont pas caractéristiques comme celles de Type 1 et peuvent être accompagnées ou non par d'autres lésions buccales. Les lésions atypiques dont on parle sont sous-groupées en deux formes :

a) la forme fixe : une ou deux régions de la langue présentent des lésions qui ne migrent pas mais qui tendent à disparaître et à faire récurrence un peu plus tard et ce, au même endroit seulement (Fig. 2).

b) La forme avortée : celles-ci débutent comme des plaques blanchâtres qui disparaîtront avant d'atteindre l'aspect dénudé caractéristique des lésions géographiques (Fig. 3).

Type 4 : Aucune lésion n'est présente sur la langue, mais la cavité buccale en est affectée. Ces lésions peuvent être migratoires ou non.

De cette classification, le Type 1 est le plus fréquent, tandis que le Type 4 est considéré comme exceptionnel.²

Malgré l'apparence caractéristique de la glossite bénigne migratoire, l'on doit inclure dans le diagnostic différentiel ces différentes possibilités: leucoplasie homogène idiopathique, leucokératose traumatique, brûlure, mucosite allergique, candidose, glossite médiane rhomboïdale. Par ailleurs, on retrouve fréquemment la glossite bénigne migratoire associée à la langue fissurée (Fig. 4). La langue fissurée peut être associée à différentes conditions telles que la trisomie²¹ ou syndrome de Down,⁴ le syndrome de Sjögren,⁵ le syndrome de Melkersson-Rosenthal,^{4,7} la tuberculose,⁸ le groupe sanguin O,⁹ une déficience en vitamine B^{12,9} la maladie de Cowden ou syndrome des hamartomes multiples.¹⁰ De plus, plusieurs auteurs rapportent que la glossite bénigne migratoire est occasionnellement accompagnée de la stomatite bénigne migratoire.^{2,11-13}

Épidémiologie

En terme de prévalence, l'étude de Bouquot et Gundlach,¹⁴ portant sur 23 616 caucasiens américains âgés de 35 ans et plus, a démontré que la glossite bénigne migratoire se situe au troisième rang des atteintes linguales après les varicosités et la langue fissurée. Selon les différentes études, la glossite bénigne migratoire démontre une prévalence



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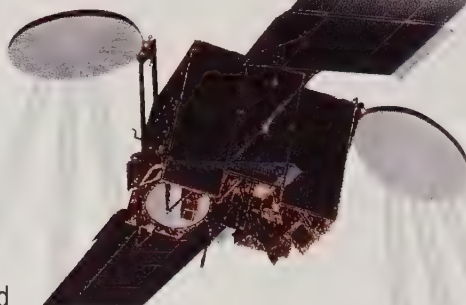
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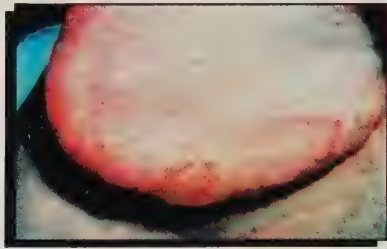


Fig. 1: Lésion caractéristique de la glossite bénigne migratoire.

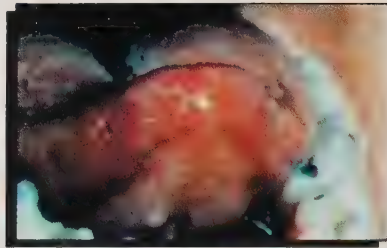


Fig. 3: Lésion de type 3, forme avortée. Cette lésion ne sera pas accompagnée de la zone dénudée et disparaître sans démontrer l'apparence caractéristique du type 1.

variant de 0,9 à 14 p. cent mais un taux d'environ 2,0 p. cent semble être reconnu comme acceptable.¹⁵ Mani, examinant 674 patients d'Arabie-Saoudite âgés de 17 à 70 ans, a démontré que 0,9 p. cent des sujets étaient uniquement atteints d'une glossite bénigne migratoire, et que 1,8 p. cent démontraient une glossite bénigne migratoire accompagnée d'une langue fissurée.¹⁶ De leur côté, Ghose et Baghdadady, examinant 6 090 jeunes irakiens de six à 12 ans, ont noté une prévalence de 4,3 p. cent.¹⁷ Sedano et al ont déterminés que 1,9 p. cent des 32 022 enfants mexicains examinés présentaient une glossite bénigne migratoire.¹⁸ Cependant, cette dernière étude n'a pas pris en considération les associations avec la langue fissurée. La majorité des études n'a pu rapporter de différences significatives reliées au genre ou la race.¹⁶⁻¹⁹ Lorsque l'âge est considéré, une différence est notable. On observe, avec le temps, une diminution de la fréquence de la glossite bénigne migratoire et une augmentation de la fréquence de la langue fissurée.¹⁶⁻¹⁹ Les résultats produits par Kullaa-Mikkonen semblent appuyer la théorie démontrant que la glossite bénigne migratoire se retrouve surtout chez les jeunes, et

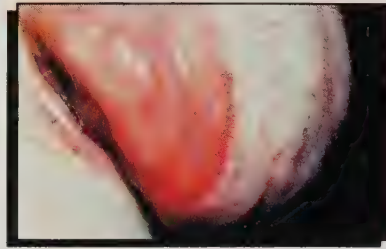


Fig. 2a: Lésion de type 3, forme fixe: apparence initiale de la lésion.

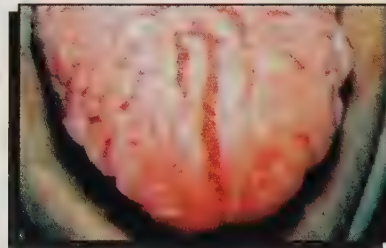


Fig. 4: Langue fissurée accompagnée d'une glossite bénigne migratoire.

que sa prévalence diminue avec l'âge pour être graduellement accompagnée ou remplacée par la langue fissurée.¹⁹

Étiologie

L'étiologie exacte de la glossite bénigne migratoire n'est toujours pas connue. Cependant, selon certains auteurs, elle serait associée à des conditions telles que la candidose,²⁰ les maladies inflammatoires aiguës et récurrentes,^{20,21} les bronchites,^{4,21} les maladies mentales,²⁰ le syndrome de Reiter,^{2-4,21-23} les déficiences nutritionnelles,^{5,16} les désordres gastro-intestinaux⁵ et les variations hormonales.²⁰ Des associations furent également démontrées entre la glossite bénigne migratoire et la langue fissurée,^{2,9,16,17,19,24} le psoriasis,^{2-4,11,21-23,25,26} le stress,^{3-5,11,17,19,20,23} des facteurs génétiques,^{2,17,19,22,24} l'atopie^{3,4,21,22} et la stomatite bénigne migratoire.^{2,11-13,22,26}

Certains auteurs décrivent la glossite bénigne migratoire comme la manifestation buccale la plus fréquemment observée chez les patients souffrant de psoriasis.²³ Zelickson et Muller rapportent cette atteinte chez 17 p. cent des patients atteints de psoriasis pustuleux généralisé.²⁵ Des études immunohistochimiques des spécimens provenant de langues géog-

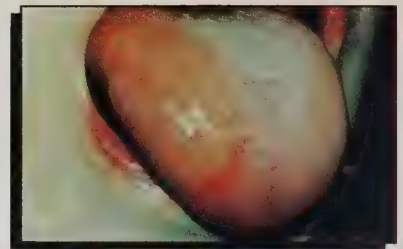


Fig. 2b: Lésion de type 3, forme fixe: apparence environ un mois plus tard.

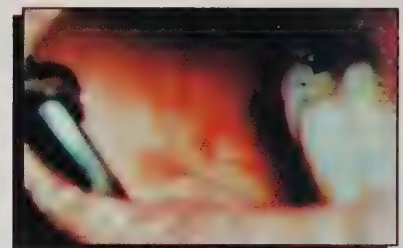


Fig. 5: Stomatite bénigne migratoire. Présence des zones érythémateuses entourées du halo blanchâtre caractéristique.

raphiques, ont démontré une similitude remarquable avec le psoriasis en ce qui a trait à la distribution cellulaire.²⁶ Malgré tout, ce lien ne semble pas faire l'unanimité.²²

Plusieurs études acceptent l'hypothèse que des facteurs de stress seraient une cause possible de la glossite bénigne migratoire sans jamais pouvoir le démontrer de façon certaine.^{3-5,11,19-21} Cependant, certains auteurs ont noté une augmentation de sévérité des lésions déjà présentes chez les étudiants lors des épisodes de stress.²⁰

Kullaa-Mikkonen¹⁹ suggère qu'un même gène causerait la glossite bénigne migratoire et la langue fissurée. Il les classifie donc comme des variantes d'une même maladie puis fait les interprétations suivantes :

1. la langue fissurée est transmise génétiquement par le mode autosomique dominant avec un degré de pénétrance incomplet et n'apparaît que plus tard chez l'enfant;
2. la langue fissurée est précédée par la glossite bénigne migratoire qui apparaît plus tôt durant l'enfance;
3. la sévérité des lésions semble augmenter avec l'âge.

Eidelman, Chosack et Cohen approuvent ces interprétations et, de plus, suggère que cette trans-

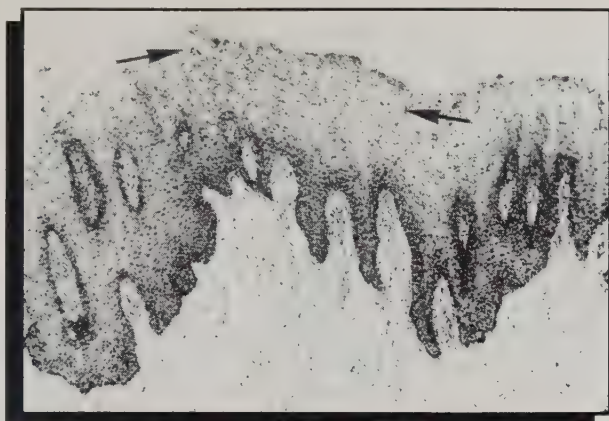


Fig. 6: Épithélium non kératinisé de la muqueuse buccale avec changements dégénératifs caractérisés par des phénomènes de spongieuse et d'exocytose de neutrophiles (flèches). (X 56, hématoxyline et éosine)

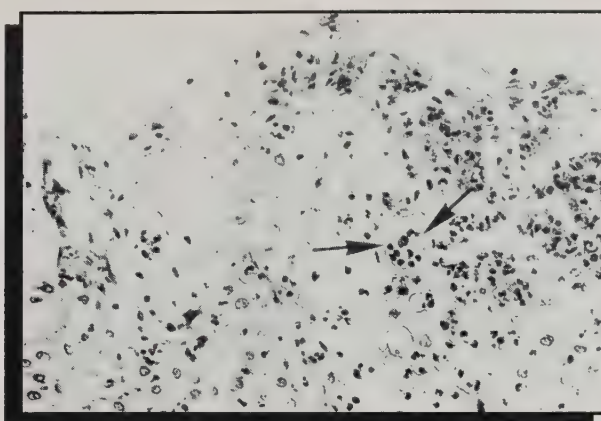


Fig. 7: Signes de dégénération de la muqueuse buccale avec formation de micro-abscesses (flèches). (X 224, hématoxyline et éosine).

mission soit de mode poly-génique.²⁴

La stomatite bénigne migratoire a été rapportée pour la première fois par Cooke en 1955.¹² Cette condition est considérée comme étant une variante de la glossite bénigne migratoire qui affecte les autres sites de la cavité buccale. Les lésions peuvent être présentes au niveau du plancher de la bouche, au palais mou, sur les muqueuses labiales et buccales, aux vestibules et plus rarement sur la gencive et le palais dur (Fig. 5).¹¹⁻¹³

Histopathologie

Avec ses différentes phases et sites cliniques, nous obtenons conséquemment différentes observations histologiques. L'oedème intracellulaire fait son apparition dès les premiers stades, soit seul, soit accompagné de quelques neutrophiles (Fig. 6).³ Avec l'évolution de la lésion, une quantité beaucoup plus considérable d'oedème épithélial est notée au niveau des bordures blanches, menant à une destruction nucléaire et cytoplasmique de ces cellules.^{3,11} Nous retrouvons également, lors de ce stade, une accumulation de neutrophiles dans les régions oedématisées de l'épithélium ainsi que la formation de micro-abscesses (Fig. 7).³ La couche cornée est habituellement absente, conséquence du grand nombre de cellules épithéliales détruites. Toutefois, très peu d'altérations sont observées au niveau de la couche basale.¹¹ La zone érythémateuse, se situant au centre de la lésion,

révèle des signes d'atrophie épithéliale²⁵ due à une perte des papilles filiformes.^{3,27} Un phénomène d'acanthose est produit tandis que les cellules musculaires ne sont aucunement affectées par la maladie.^{19,27,28}

Des coupes, venant de la zone atrophique de la lésion, nous ont permis de constater qu'avec l'évolution de celle-ci, on observe:

1. une baisse d'oedème et d'infiltration de neutrophiles, causant ainsi une diminution de l'épaisseur du tissu conjonctif sous-jacent;
2. l'augmentation de l'épaisseur de l'épithélium,
3. la formation de nouvelles papilles filiformes.

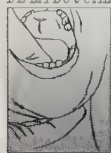
Basées sur certaines similarités, des associations histopathologiques ont été suggérées entre la glossite bénigne migratoire et la langue fissurée,^{9,19,27} la stomatite bénigne migratoire^{11,13} et le psoriasis.^{4,11,22,23,25,26}

Traitement

Quoique généralement asymptomatique, jusqu'à 25 p. cent des patients peuvent se présenter avec une glossopyrose ou une glosodynie transitoire. La grande majorité des personnes atteintes a noté que leur langue était plus sensible suite au contact avec des aliments épicés et que parfois cette sensation persistait pendant plusieurs jours.^{11,13,29} Certains patients peuvent même se plaindre d'un goût métallique ou d'une sensation de xérostomie.²⁹

Plusieurs approches ont été suggérées afin de réduire ou d'éliminer ces symptômes. Une des plus surprenantes est rapportée par Henricsson et Axell²⁹ et consiste à «mordancer» les surfaces atteintes avec de l'acide salicylique à 7,0 p. cent dilué dans une solution d'alcool à 70 p. cent. Les auteurs rapportent des résultats très spectaculaires sans aucun effet secondaire. De plus, une rémission prolongée aurait été observée. Malgré tout, il est important de noter que cette étude était non contrôlée et que l'évaluation n'était pas faite «à l'aveugle». Sigal et Mock³⁰ ont rapporté un contrôle adéquat des symptômes chez de jeunes patients avec l'usage de diphénhydramine en élixir pour des cas symptomatiques.

Dans la très grande majorité des cas, aucun traitement n'est justifié puisque les lésions sont asymptomatiques. Lors des épisodes actifs, il est recommandé d'éviter les aliments épicés. En présence de symptômes persistants, des traitements palliatifs consistant en des applications d'anesthésique topique ou de solutions émollientes, ou la combinaison des deux peuvent être considérés.^{11,13} Malgré leur caractère anti-inflammatoire, l'usage de corticostéroïdes topiques semble plus ou moins efficace. Le fait de brosser la langue peut empêcher une accumulation bactérienne ou fongique, surtout lorsque la glossite bénigne migratoire est accompagnée d'une langue fissurée.



Conclusion

De façon générale, la glossite bénigne migratoire, avec son aspect caractéristique, est cliniquement facile à diagnostiquer. L'évolution et le déplacement éventuel de cette lésion lui ont mérité le terme de «langue géographique». Il est important de se rappeler que cette condition peut être associée à la stomatite bénigne migratoire ou à la langue fissurée, cette dernière lui étant génétiquement liée.

Environ 2,0 p. cent de la population se trouvent atteints sans aucune prédilection de genre ou de race. Les premières manifestations surviennent tôt dans l'enfance ou l'adolescence. Avec l'âge, la fréquence d'observation de ces lésions semble diminuer et/ou s'accompagner d'une langue fissurée. L'atteinte est habituellement asymptomatique, mais certains patients peuvent se plaindre d'une glossopyrose ou d'une glossodynie. Le rôle du dentiste est surtout d'informer et de réassurer le patient sur le caractère bénin et non-infectieux de cette atteinte.

Nos connaissances sur cette lésion énigmatique, même après avoir été rapportée pour la première fois depuis plus d'un siècle et demi, demeurent toujours som-
maires. ■

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Le D^r Nancy Beaudoin est résidente au programme de résidence multidisciplinaire en médecine dentaire de l'Université Laval.

Le D^r Kevork Manoukian est résidente au programme de résidence multidisciplinaire en médecine dentaire de l'Université de Montréal, Centre Hospitalier de St-Mary.

Le D^r Benoît Lalonde est spécialiste en médecine buccale, professeur adjoint, Faculté de médecine dentaire, Université de Montréal.

Demandes de tirés à part à : D^r Benoît Lalonde, Université de Montréal, Faculté de médecine dentaire, Département de stomatologie, C.P. 6128, Succursale Centre-Ville, Montréal, Québec, H3C 3J7.

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disc displacement can occur in situations in which the thicker posterior band of the disc is jettisoned forward between the condyle and temporal bone as the condyle is forced posteriorly. In traumatic situations in which the anterior disc attachments to the condyle and temporal bone are torn or attenuated, it is possible but uncommon for the discs to be displaced posteriorly with the condyles.

Dr. Mulrooney states "obviously this case was originally seen as a cosmetic operation and the effects on the TMJ's were neither foreseen nor intended." This is a rather surprising statement for a contemporary dentist to make, given the fact that surgery to correct skeletofacial deformities has traditionally been done for functional rather than cosmetic reasons, and this principle has been emphasized in the dental literature for the past 45 years.

"Again the neuromuscular factor has been ignored." And again Dr. Mulrooney is pole-vaulting to a hypothetical conclusion that reflects conjecture rather than fact. In fact, one of the primary objectives of the surgical correction of skeletofacial deformities is the establishment of neuromuscular balance in the craniofacial complex. With this goal in mind, it is difficult to comprehend how one can conclude that the neuromuscular factor has been ignored in the management of this patient.

Case 3

Once more, Dr. Mulrooney bases his comments in this paragraph upon "ifs," "maybes," "probably," "I take it," etc., e.g. "Case 3 again illustrates the error of focusing exclusively on the joint." How does Dr. Mulrooney know this to be so? Perhaps he is omniscient, because obviously only the clinician who treated the patient at that time would know whether he focused exclusively on the joint.

Similarly, Dr. Mulrooney says: "Meniscectomy was done, I take it, because the disc was displaced and severely damaged." Again, this is an assumption that "may" be correct, as the presence of a severely damaged

disc is one of the indications for meniscectomy.

Dr. Mulrooney also speculates that: "The cause most probably lay in an abnormal relation between mandible and cranium which appears not to have been addressed at all. Thus the effect was treated, the cause ignored."

Dr. Mulrooney appears to be convinced that TMJ treatment failures are usually the result of craniomandibular malrelationships. He is clearly a disciple of the one-cause, one-treatment philosophy for all TMJ disorders, and he apparently feels that the recognition and treatment of "neuromuscular factors" in TMJ pain dysfunction patients should result in a 100 per cent success rate.

Evidently, Dr. Mulrooney believes that every treatment failure has an explainable cause and that every TMJ pain dysfunction patient can be treated successfully. Simply because a patient's condition improves after treatment doesn't necessarily mean that the treatment was responsible for the improvement. In my opinion, the single greatest cause of clinical frustration and anguish is persistence in the belief that everything can be fixed. This just isn't so.

Dr. Mulrooney also states that he could present many other cases that he has treated conservatively after failure of surgery. Conversely, I have surgically treated many patients with well-documented TMJ pathology who have undergone unreasonably lengthy periods of appropriate non-surgical therapy without improve-

ment in their symptoms. The fact that so many TMJ patients improve with such diverse therapies is simply a manifestation of the multifactorial nature and complexity of TMJ pain dysfunction.

Not unexpectedly, the numerous theories and general lack of clarity concerning the etiology and pathogenesis of temporomandibular disorders (TMDs) has created a fertile field for the growth of a variety of clinical approaches and concepts in the diagnosis and treatment of TMDs. However, many of these treatment techniques have a limited scientific basis and only a few have been universally accepted.

Ultimately, the goals of treatment for TMDs are to reduce or eliminate pain and to improve joint function. Clearly, these objectives can only be realized through the efforts of well-controlled basic and clinical scientific research studies. Only the clinical application of new knowledge generated in this manner has the potential for long term success in the management of these baffling and challenging problems.

Finally, Dr. Mulrooney can rest assured that the practitioners involved in the management of the patients described were well aware of "the tripartite nature of the craniomandibular articulation and the neuromuscular factors involved." This is, after all, one last assumption to which I feel entitled.

Simon Weinberg, DDS, FRCD(C)
University of Toronto

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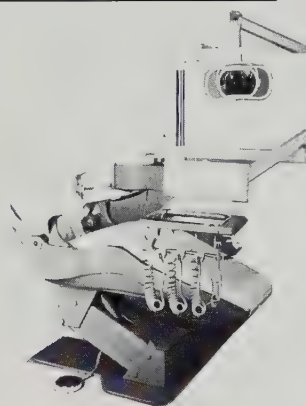
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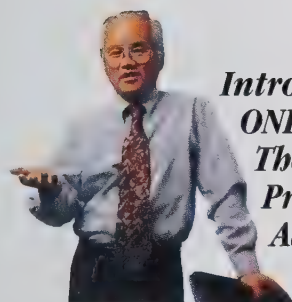
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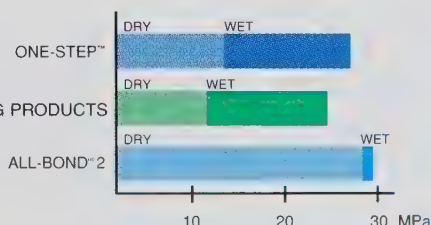
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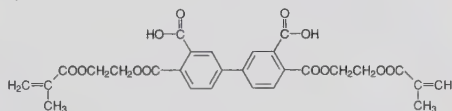
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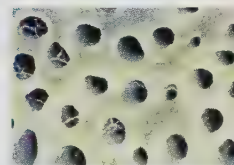


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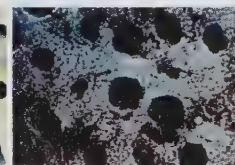
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* US Patent #5,348,988 † US Patent #5,385,728 ‡ moist does not mean saliva or blood contaminated
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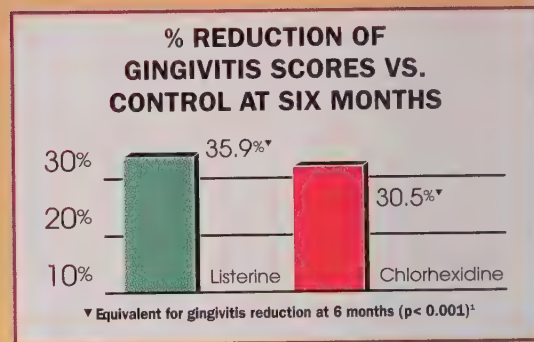
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2. Data on file, 1995.

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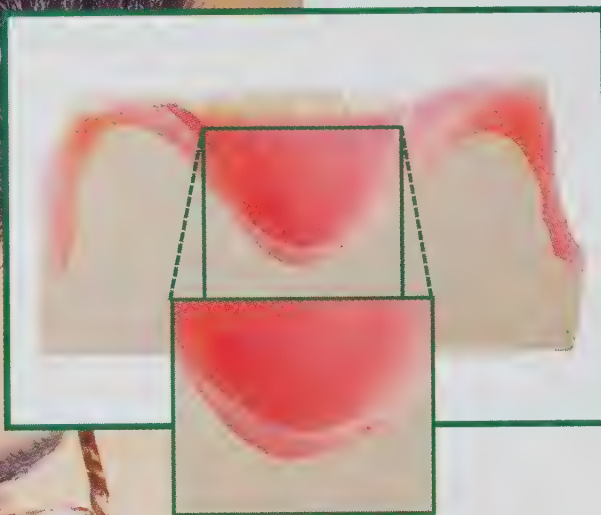
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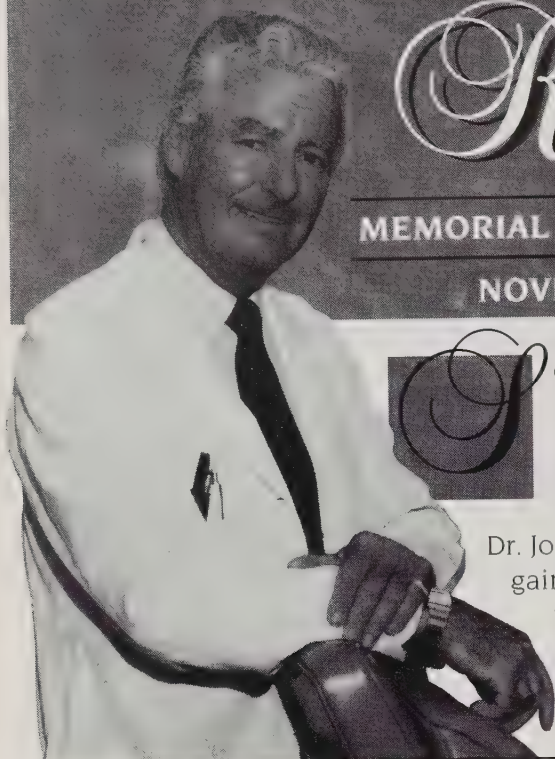


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the Ronald E. Jordan

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Scientific clinical evaluation of current materials was the basis on which Dr. Ronald E. Jordan developed a world wide reputation for excellence in dentistry. Dr. Jordan's focus was the betterment of dentistry in Canada and throughout the world. The enormous amount of time and energy devoted to his work resulted in the development of new innovative and efficacious techniques. Dr. Jordan's informative and rapid-fire presentations allowed the general dentist to gain the necessary understanding and skills to implement his state of the art techniques immediately into their every day routine, with predictable results. Please join Dr. Jordan's friends, family and colleagues in honouring his many accomplishments. Your support for this symposium will benefit the Ronald E. Jordan Memorial Research Fund and ensure his work will continue!

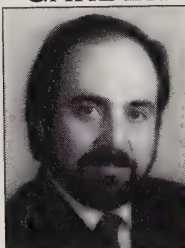
Dr. Garber graduated from the University of Pennsylvania with post doctoral training in both periodontics and fixed prosthodontics. Currently Dr. Garber has a dual appointment at the Medical College of Georgia School of Dentistry, Augusta, Georgia as Clinical Professor of Prosthodontics, as well as Clinical Professor of Periodontics. He lectures extensively on multi disciplinary approaches to optimizing esthetics. His programs integrate restorative dentistry and periodontic implants in developing total dental facial harmony. Dr. Garber's lecture experience is world wide, he has published innumerable articles and dental texts and is an active member of many distinguished dental societies.

DAY 1 - Dr. David Garber
Friday November 3rd, 1995
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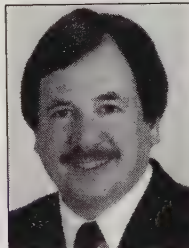
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featuring

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DR. JOHN KANCA



Dr. Kanca is a graduate of The University of Connecticut and has a private practice in Middlebury CT. with the emphasis on Cosmetic Dentistry. He is a founding member and past president of the American Academy of Cosmetic Dentistry and is a member of the International Association of Dental Research. Dr. Kanca is recognized worldwide as one of the leading authorities on Adhesion Dentistry. Dr. Kanca is attributed with discovering the ability to bond to wet tooth structure as well as being the first to generate a gap-free restoration in-vivo. He is also the recipient of the prestigious Hinman Medallion and most recently Dr. Kanca received the Gordon Christensen Award (1995).

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No one could have entered the realm of composite bonding or adhesive dentistry without having been heavily influenced by Dr. Ron Jordan. He made composites a part of mainstream dentistry by being involved in research, clinics and those innumerable lectures around the globe – which is how I met Ron Jordan ... a teacher, mentor and friend who helped guide me, not only in my early clinical endeavors, but later with my own teaching and writing.

No one was able to teach more in less time and in so many disciplines. Most every dentist can reflect back and remember Ron not only for what he did for each of us personally, but also for what he did for the profession as a whole.

David Garber

Ron Jordan was a teacher to me at first, then he became a good friend. I greatly admired his uncompromising adherence to principles – those of quality and excellence. When I was no more than a name on a registration form, he took the time to listen to what I was doing in research. When the dentin etching controversy came along, he was the first to say that he would accept our findings when we provided him with data to support our claims. We showed him the research results and he became a strong supporter. The difference between Ron and so many others was that while he may have been initially skeptical, he never denigrated efforts at change and was never discouraging. For that inspiration I shall be eternally grateful.

John Kanca, III

Ronald L. Jordan

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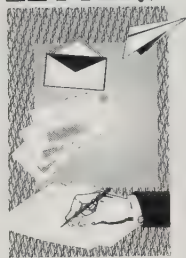
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LETTERS



Can't Do It Alone

I wish to compliment the *Journal* for the editorial "CDA = Can't Do It Alone" which appeared in the August issue. Not only, as the editorial suggested, should members consider the bottom line, but as a profession, we are not an island unto ourselves. For many years we were more worried about sullyng our own reputation than caring for the dental health of our citizens. Dealing with ethical organizations has raised our standards and has made dental awareness and information readily available to those we serve.

J. Fred Reid, DDS
CDA President, 1974-75
Brentwood Bay, B.C.

Redefining Success

Mr. Imtiaz Manji's article in the July '95 issue, "Redefining Success in Dentistry," was very informative, practical and often inspirational. The point about "measuring up" to production levels as opposed to identifying success criteria on a broader perspective was well taken. The hard work involved in practice management should be focused on patient care communications and staff satisfaction as he indicated to achieve the overall balance for a successful practice.

Leonard Schwartz, B.Sc., DDS
Thornhill, Ontario

Infection Control

The cover in June '95 illustrates to me the illogical and ridiculous lengths to which dentistry is being

pushed. What happened to the good old days when the patient came in, sat down, was anesthetized locally, a dam placed and a simple MO amalgam inserted without all the fall-de-roll of head-caps, gloves, masks and the like? And, what about a dentist's human rights? Why can't a dentist treat whoever he or she wants. For example, if an operator doesn't want to treat left-handed people that should be his or her right. Where did our freedom of choice go in a private practice? More's the pity!

C. Ronald Hill, BA, DDS, Dip.
Ortho.
Parksville, B.C.

Although the subject was infection control in the June 1995 editorial it did remind us that a prime professional responsibility is to act, "in the best interests of our patients," which means, "seeking the truth."

The latter principle has not always been evident in recent articles and letters which have commented upon the De Marco "AIDS Discrimination Case." Our society has assigned the responsibility for establishing a fair interpretation of this case to an independent arbitrator, who has access to the relevant information. Unless we are privy to all such details, passing judgment based upon second or third hand reporting demeans the concept of, "seeking the truth."

The truth is that after at least 15 years of AIDS in North America, there is no evidence which irrefutably establishes that AIDS has been transmitted during dental treatment. A reasonable conclusion from this situation is that, until it is proven otherwise, AIDS transmission is not an occurrence associated with dental practice. This truth places an entirely different perspective upon AIDS discrimination cases, and upon infection control recommendations.

Dr. Crawford has correctly insisted that progress is based on "sound research conducted according to the best scientific principles." Therefore, it is not ironic

that the majority of presently approved infection control procedures have not been subjected to such criteria? Until our dental associations and licensing bodies have the results of appropriate scientific studies, they do not have the truth upon which to make recommendations that are in the best interests of our patients.

Perhaps, the Canadian Dental Association will support the principles of the editorial by funding research which test the hypotheses that wearing gloves significantly reduces the risks of AIDS transmission in dental practice, and subjecting handpieces to a sterilization cycle significantly reduces the acquisition of dentally acquired nosocomial infections.

Such studies would establish truths which would be in the best interest of our patients and our profession.

John Hardie, BDS, M.Sc., PhD,
FRCD(C)
Tabuk, Saudi Arabia

Ottawa Discrimination Case

I want to express great concern and sympathy for the "Ottawa Dentist Faces Charges of Discrimination" as reported in the July/August issue of *Communiqué*. First, she treated the HIV positive patient and secondly, she did what she felt was in the patient's best interest and also her own.

It is absolutely imperative that the CDA support this dentist. This support should take whatever form is necessary. The CDA must show leadership in this case. Once precedent has been established, if it is of a negative nature, all dentists will become fair game.

I have been a member of CDA for forty years and have supported this association, but if the CDA does not act in a very positive manner to protect this practitioner, then this is an organization that is not worthy of membership.

Albert J. Schutz, DDS
Westmount, Quebec

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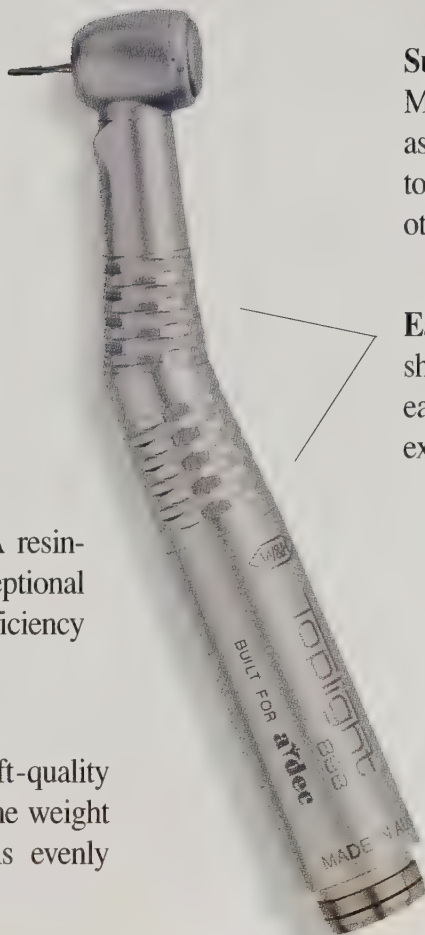
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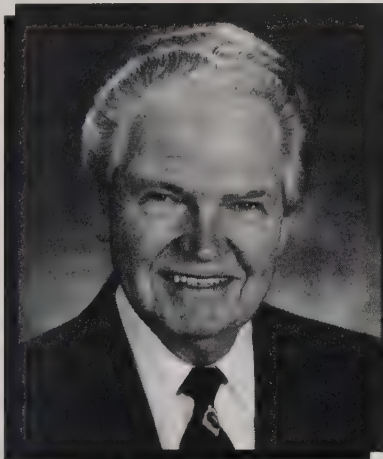
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EDITORIAL

I DO NOT UNDERSTAND IT



Dr. P. Ralph Crawford,
Editor.

In the late 1800s, thousands of immigrants flocked to Western Canada to find new hope and new opportunity on the vast fertile plains.

As with many new ventures, despite good intentions, the bright expectations of the settlers were accompanied by considerable political upheaval, possibly greed, and undoubtedly discrimination.

Many of Canada's native people, displaced from their traditional lands through treaties and the influx of immigrants, were relegated to reserves. And many found it difficult to understand and certainly to accept the dawn of "civilization."

A Cree chief by the name of Poundmaker, concerned by the plight of his oppressed and starving tribe, took part in the North-West Rebellion. When he was tried for treason-felony in 1885, Poundmaker said, "The law is a hard, queer thing. I do not understand it."

These words may be as true today as they were then. One hundred years has not changed the Canadian scene very much. We still have hope, but we are still beset by political upheaval, unresolved native land claims, and greed.

Discrimination hasn't disappeared either, although Canada's federal and provincial governments are to be lauded for their noble efforts to legislate against it.

Whether it's openly practised or insidiously sanctioned, discrimination is intrinsically wrong. But putting an end to it, even in today's politically-correct society, hasn't been easy. Human love, respect and understanding are difficult to legislate.

Recently, several cases involving discrimination against HIV-positive dental patients have caught the attention of both the profession and the public. In Quebec, a dentist was charged with discrimination after cancelling the appointment of a patient who had revealed that he was HIV-positive on a pre-examination medical questionnaire. The Quebec Human Rights Tribunal found the dentist guilty and ordered him to pay the patient \$3,000 as compensation for moral damages.

The decision in the Quebec case undoubtedly raises a question for dental practitioners: Do we dentists have the right to choose who we want to treat? The answer under the law — and in the light of human decency — is clearly and unequivocally, no. Like it or not, we have no more right to refuse dental treatment to an HIV-positive patient than a restaurateur has to refuse to serve a meal to a person because of their color or religion.

The recent Ottawa case, where a dentist was deemed to have discriminated against an HIV-positive patient because she wore an extra disposable gown over her normal infection control garb, has caused much more of an outcry than the Quebec dentist's refusal to treat.

In this case, the dentist actually saw the patient on several occasions. The discrimination charge arose solely because she modified her usual barrier techniques based on the patient's HIV status. To most dentists, the extra precaution she took may seem acceptable and even logical, but the HIV-positive patient found it disturbing enough that he cried foul to both the Ontario Human Rights Commission (HRC) and the Royal College of Dental Surgeons of Ontario (RCDS).

The case placed the RCDS in a difficult position. Technically, there is little doubt that the dentist went beyond the RCDS's policies on infec-

tion control. And the law, as much as it is "a hard, queer thing," is the law.

The RCDS complaints committee panel was likely as lenient as it could be, under the circumstances, when it determined that the dentist should present herself to receive an oral "caution."

At the time of publication no one, except numerous dentists around the country, is saying very much because the matter is still under investigation. Currently the matter is not an issue open to the public and confidentiality is being preserved. The patient continues to press for a settlement on his terms and the Ontario Human Rights Commission is attempting to mediate between patient and dentist and will only mount an official inquiry if the mediation process fails.

In the meantime letters from across the country keep coming and the phone continues to ring with a common message. "What is the CDA doing to aid and support one of its members?" As long as the case is in the discussion/mediation stage there is very little that can be offered at this time. The matter has been thoroughly discussed by the CDA management committee and both moral and political support has been offered to the Ottawa dentist.

We will maintain the waiting game of legal intricacies and report progress as it unfolds. Readers are encouraged to turn to page 871 of this issue of the *Journal* and read the article *The Law and Ethics in Dentistry* by Mr. Peter Graham, a Montreal lawyer, and Dr. Mili Harel-Raviv from McGill's faculty of dentistry. Their article takes readers step-by-step through an analysis of a Quebec Human Rights Tribunal and concludes with suggestions of conduct when the next HIV positive patient walks through your door.

Considering all the above, who would think that the words of an Indian chief, who was only trying to help his people, would be as true today as they were more than a century ago. "The law is a hard, queer thing. I do not understand it."

P. Ralph Crawford, BA, DMD
Editor of the *Journal*
of the Canadian Dental Association

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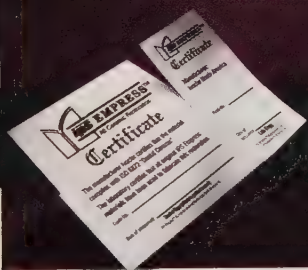
— **Gordon J. Christensen, DDS, MSD, Ph.D,**
"A Void In U.S. Restorative Dentistry,"
JADA, Vol. 126, (February, 1995), 244-245

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— **John W. Farah, DDS, Ph.D,**
The Dental Advisor PLUS
Vol. 5, No. 3, (May / June, 1995)

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— **Dr. Michael Miller**
Reality, Vol. 9, (January, 1995)



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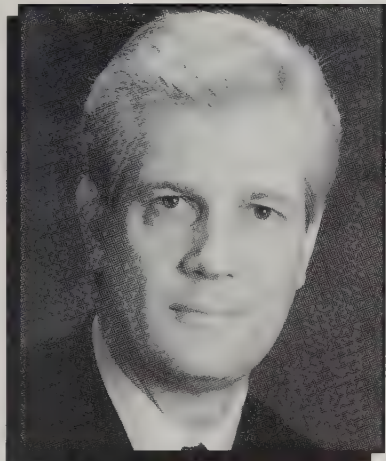
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PRESIDENT'S COLUMN

ISSUES FOR THE FUTURE



Dr. Jim Brookfield,
CDA president.

As an incoming CDA president, you run the risk of being redundant. You've got all kinds of issues that you want to talk about, but unless you come up with a new and different approach, your constituents will probably have heard your message many times over.

The problem is that many issues stay around a long time. You think you have them wrestled to the ground, but then they throw a new twist at you and they're up and running again.

Take the taxation of dental benefits issue. We held it at bay in 1994, and got it pretty well on the ropes in 1995, but it's still hanging in there. In fact, I'd say that it still tops the list of issues that CDA will have to come to grips with in the coming year.

At this point, having just given the dental benefits issue our best shot — the "Enough is Enough" campaign — you sort of wonder what to do next. How do we resolve the equity question to Finance Minister Paul Martin's satisfaction and get this issue off the table once and for all?

We're certainly working on it. The word we received from dentists last year is that a dental benefits tax would have been "devastating." And, as the authoritative national voice of dentistry, we have a

role to play in making sure that the interests of both dentists and their patients are protected.

At this point, however, we've chosen to work behind the scenes. Given the high level of support generated by the Enough is Enough campaign last year, another public campaign may be unnecessary. Canadian politicians know the public's mood on this issue, and the federal government would be unwise to ignore it. Nevertheless, the effort to balance the budget is pervasive, and taxing dental and health benefits would provide the government with a significant source of new funds. Tax grab or not, it has to be a tempting strategy.

Clearly, all of us who care — and I hope it is every dentist in Canada — must be prepared to take public action on this issue if and when it becomes necessary.

The next issue on our list, as much as I hate to say it, is the evolution of third-party plans. Employers, in an attempt to decrease costs, seem to be moving toward cafeteria-style benefit plans, where employees can pick and choose various coverage options to meet their perceived needs. In the near future, employees will likely be able to enhance, reduce or drop their dental benefits, as they see fit. There is no doubt that different employees will make different choices, but we can be sure that the value they place on their dental care will be a deciding factor in their selection of plan options.

In addition to the growing popularity of flex plans, the evolution of dental benefits has also involved direct changes to conventional-style plans. We've all seen how increased deductibles, limitations on payment, restrictions on who will be paid for certain services, and many other not so-subtle changes will affect our historic way of practising dentistry.

I believe these changes point to the larger issue facing our patients and our profession — the rebirth of managed care. Despite all the hype, in the final analysis managed care really means managed costs. It's not a new concept. Most of us remember the capitation wars

of the 1980s, when insurance companies thought they could run our businesses better than we could.

We won the battle. After losing millions of dollars, the insurance companies involved in the managed care fight in Canada retreated to the status quo. Now, however, round two seems poised to begin. Managed care in the U.S. is big. It controls a significant percentage of the dental market, and it is being pushed by a handful of large, financially sound, and business-hardened companies. Recently, we've seen them entering Canada, buying up large patient-pools, and saying that they're poised to save this country's oral health with managed care. Well, beware.

Then there's the ongoing controversy over dental amalgam. If Health Canada limits the use of dental amalgam in response to the Richardson report, which reflects the opinions of a single researcher, our patients will be robbed of the most universally used and widely accepted dental material in this world. Unless there is clear scientific consensus that limitations are warranted — which cannot be determined without further original scientific research — CDA believes that the continued use of dental amalgam is in the best interests of patients and dentists.

I don't have space to really tackle the fifth issue on my list — the future of dental education in Canada — but with the recent integration of the University of Alberta's dental faculty into a restructured faculty of medicine and oral health sciences, and the increasing numbers of Canadian dentists being trained in the United States, it will no doubt be explored in future columns.

These are but a few of the issues facing our profession. Over the coming months, my intent with this column is to touch on several issues, and to assure dentists that CDA continues to work on their behalf.

*James R. Brookfield, DDS
President of the Canadian
Dental Association*

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BOOK REVIEWS

Health Economics in Dentistry

by Risto Tuominen

1994, MedEd Inc., Malibu, California;
161 pages
ISBN: 0-9642368-0-X

The author of this slim, soft-covered book aims to examine the basic laws of economics as they apply to clinical dentistry. The scope is limited to a microeconomic examination of the dental practice as a "firm" and avoids macroeconomic issues such as demand for dental manpower and the impact of the overall economy on dental practice. An introductory text, the book is aimed at a wide audience including dental students, dental practitioners and economists who might wish to appreciate the perspective of the clinician. No previous knowledge of economics is assumed and the author recognizes that many dentists may be suspicious of the need for a "good working knowledge of economics in everyday clinical dentistry."

The contents of the book are presented in the form and order that is usual in microeconomics texts. There is an introduction which highlights the fact that economic factors enter into many clinical decisions that dentists make every day. The dental "market" is examined and compared to free markets. The dental market differs in two important respects from the theoretical "free" market: suppliers are not free to enter and leave the market due to regulation; and the assumption of "consumer sovereignty" (central to the free market theory) does not hold in dentistry because the dental patient does not know what is good for him or her. Because these two conditions are violated, the author contends that the applicability of the general price theory is severely limited in dentistry.

Despite this limitation, there is an examination of the demand for

dental treatment, the behavior of suppliers, and the tendency for price increases to drive down the demand and increase the supply of treatment. There is a lengthy exposition on the substitutability of different types of dental provider, and this is linked to a theoretical demonstration of how a dental practice can increase its production efficiency by using different types of workers.

In true free markets, there is an equilibrium reached between supply and demand, where a certain price can be commanded for a certain quantity of service. Although this equilibrium is dynamic in free markets, it may never be reached in dentistry because many dentists operate as if a "price floor" exists (i.e. a price below which they will not provide services). The author hints that price-fixing and the creation of a cartel is possible in dentistry, but he also asserts that the practice of dental associations circulating lists of suggested prices for treatments is largely a thing of the past.

This assertion, as well as some stated assumptions such as — the more a consumer attends for dental treatment the better his oral health is likely to be; and that non-dentists don't know what dental treatment is best for them — reflect the author's goal to present the basics of economics from the perspective of the clinical dentist. A health economist might take issue with some of these assumptions and such ideas may become increasingly dated with the continuing rise of consumerism and the level of education and health awareness displayed by the modern public. We can expect more of our patients to consult us with the results of a Medline search in their hands and demand evidence-based dental care. Even if I disagree with the perspective of the author, at least he stated his perspective and bias "up-front."

This was not the easiest of books to read. The proofreading

and editing appear to be inadequate as there are many typographical errors and cumbersome sentence constructions. It would have been helpful if there had been footnotes or references included in the body of the text rather than just including an un-referenced bibliography at the end of the book. Many of the figures are labelled inadequately and require lengthy study to be understood. A second edition would surely correct these deficiencies.

Even though I support the author's desire for dentists to have a greater working knowledge of economics, I don't see this book becoming a fixture in the library of every general dental practitioner in the land. The author is however to be praised for introducing some very important issues such as supplier-induced demand, price-fixing, the imperfections of dental markets, and economic evaluation. I realize that it is difficult to deal in great detail with these topics because of the introductory nature of the book and the fact that there is a lack of solid economic data relating to many aspects of dental practice.

Reviewed by:

John P. O'Keefe B.Dent.Sc.,
M.Dent.Sc., MBA
Dental Health Specialist,
Metro Toronto Teaching Health
Units and Assistant Professor,
Department of Community
Dentistry, Faculty of Dentistry,
University of Toronto.

Self-Assessment Picture Tests in Dentistry, Prosthodontics

by Ray B. Winstanley
(11 contributors)

1994, Times Mirror International Publishers Ltd. (Mosby-Wolfe); 143 pages,
more than 200 illustrations, \$55.50
ISBN: 0-8151-9336-X

This great little book is the size of a thin paperback novel, and has no pretensions of being a textbook.

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The book is divided into two sections. In the first half, 215 brief prosthodontic cases or problems are presented, accompanied by color photographs. The answers to the problems are provided in the second half.

Questions are posed in a number of formats: multiple choice, short answer, and case history. The reader is asked to solve problems and make material choices or treatment decisions based on situations encountered in clinical practice. Although the accompanying photographs are somewhat small due to size constraints, they are so excellently reproduced that, in most cases, this is not problematic. The answer section is fairly thorough, and it is cross-referenced to allow readers to easily

explore related problems. This cross-referencing proves advantageous, since the index is too abbreviated to be of much use — a definite disappointment given the care taken in other aspects of the book.

Most prosthodontic topics are covered in this volume, including implants, although there is a notable emphasis on removable prosthodontics. Most problems are presented succinctly, and readers can easily review numerous questions at one sitting. Most readers will probably use the book in this fashion, since there are no chapters or theme sections.

There are minor problems with the text, but none that would detract from the book's general usefulness. Occasionally, insufficient information is provided to allow

correct interpretation of the problem. Some answers are based more on opinion than objective, scientifically-based fact, and some terminology reflects a British rather than a North American perspective (all contributors are from the United Kingdom). But overall, the authors have produced an engaging self-test in prosthodontics that should appeal to students and clinicians alike. People who are looking for a succinct review of prosthodontics should buy this book.

Reviewed by:

*Robert W. Loney, DMD, MS
Associate professor,
College of Dentistry,
University of Saskatchewan.*

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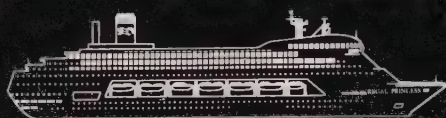
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NEWS UPDATE

Mount Royal A/O Elects News Executive



Dr. Joseph Szwimer

Montreal's Alpha Omega Mount Royal Dental Society recently elected a new slate of officers to serve on its executive committee for the 1995-1996 term.

Dr. Joseph Szwimer will serve as president. Other members of the society's new executive include: Dr. Jack Turkewicz, vice-president, continuing education; Dr. Lorne Wiseman, vice-president, finance; Dr. Brian Kizner, treasurer; Dr. Emil Shiri, secretary; Dr. Jacob Tink, alumni chapter deputy; Dr. Jeff Tenser, editor; Dr. Jay Waxman, managing editor; Dr. Warren Retter, immediate past-president and Dr. Elliot Goldenberg, regent. ■

Marnie Forgay becomes CDHA's 31st President

Margery (Marnie) Forgay of Mesachie Lake, B.C., became the 31st president of the Canadian Dental Hygienists Association (CDHA) in June.

Ms. Forgay has been a teacher and leader in the development of dental hygiene education for more than 30 years. A 1952 graduate of the Eastman Dental Dispensary in Rochester, N.Y., she also earned a bachelor of arts from the University of Saskatchewan in 1955, a bache-

lor of education from the University of Manitoba in 1976, and an MA from the University of British Columbia in 1980.

In addition to her earned degrees, Ms. Forgay was presented with an honorary doctorate of laws degree by Dalhousie University in 1994. One year later, in 1995, she was appointed professor emeritus by the University of Manitoba.

Ms. Forgay founded the University of Manitoba's school of dental hygiene in 1963. She ultimately provided 32 years of service to the school before retiring in 1994. Ms. Forgay was also director of the school of dental hygiene at Dalhousie University for a five-year term. ■

AGD Lifts Mandatory Membership Requirement

Delegates to the Academy of General Dentistry (AGD) voted 120 to 76 in favor of removing the requirement that AGD members must first be members of either the American or Canadian Dental Associations.

The declining number of general dentists joining ADA, as well as the overall decrease in the number of general dentists currently graduating from dental school, formed the basis for the decision, making removal of the requirement an economic strategy for growth that AGD leaders hope will benefit the Academy as well as the profession.

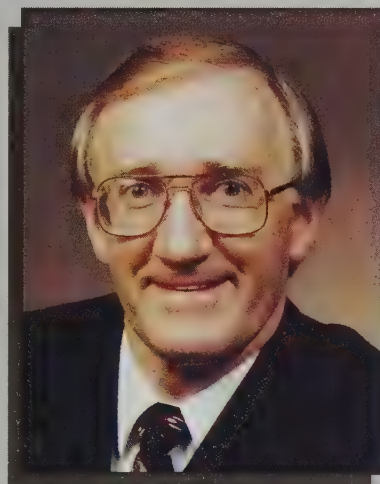
AGD president, Dr. Howard S. Glazer, says: "I believe the ADA's effectiveness and future do not rely on the Academy's membership requirement, but that the Academy's removal of the requirement will open the way for more general dentists to experience the value of their participation in decisions affecting their profession and lead to increased involvement in organized dentistry."

Dr. Richard D'Eustachio, president of the American Dental Association, stated in the *ADA News* July 10, 1995, "I have been told by the AGD leadership that they will remain complementary and supplemental to the ADA. They are honorable people, and I believe this is their intent. Yet I have difficulty envisioning how this will happen. Dentists must and will join an or-

Dr. Toby Gushue Voted CDA Vice-President

Dr. Toby Gushue of St. John's, Newfoundland, was elected vice-president of the Canadian Dental Association during its annual meeting in Ottawa, August 25-26. He will join CDA president, Dr. James Brookfield, and president-elect, Dr. Barry Dolman, as the newest member of CDA's management team.

Dr. Gushue has been in private practice since graduating from the faculty of dentistry at Dalhousie University in 1973. He served as executive director of the Newfoundland Dental Association from 1980 to 1987, and launched onto dentistry's national scene when he joined CDA's third-party dental plans committee in 1984. A member of



Dr. Toby Gushue

the board of governors since 1987, he was appointed to the CDA executive council in 1991. ■

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ganization that represents their issues and concerns before courts, legislators, regulatory agencies and insurance entities. Now they will be ... asked to make a choice. My fear is that they will be misled into believing that both groups do the same things and that cost is the only factor. Many will choose the cheaper one."

The Academy of General Dentistry has a membership of almost 32,000 of which 1,434 are Canadian. ■

Renowned Oral Pathologist, Dr. Jens Pindborg Dies

Dr. Jens Pindborg, recognized around the world as a pre-eminent and pioneering oral pathologist, died at his Denmark home on August 5, 1995, of pancreatic cancer. He was 73 years old.

Dr. Pindborg was the former professor of oral pathology at the Royal Dental College in Copenhagen where he had received his dental degree in 1943. He lectured extensively throughout the world and had authored 20 books and more than 360 papers on oral biology.

His Atlas of Diseases of the Oral Mucosa remains a classic in oral diseases and his collaboration with Drs. Deborah Greenspan, John S. Greenspan and Morten Schiødt in publishing AIDS and the Mouth brought one of the first comprehensive texts on AIDS to the dental community.

Dr. Pindborg was deeply concerned with oral care in third world countries, and had worked in the World Health Organization reference centres as a director on oral tumors and lesions, oral precancerous conditions, and oral manifestations of HIV and AIDS. ■

Nepean Dentist comes Closest-to-the-hole

Nepean dentist Dr. Don Clark won the Dentistry Canada Fund/Aurum Ceramic Golf Challenge August 27 when he came "closest-to-the-hole" during the \$1 million shoot-out at the Chaudière Golf Club in Aylmer, Quebec.

Held during the 1995 CDA Convention in Ottawa, Dr. Clark's winning shot was the best to date of the more than 800 golfers who have competed in this national tournament. His personal prize was a gold

Canadian maple leaf presented by tournament sponsor Nobelpharma Canada Inc.

But the real winner was the Dentistry Canada Fund (DCF), which will begin a \$10,000 endowment fund in Dr. Clark's name. The interest from the fund will assist DCF in its education, research and awareness programs.

"It was wonderful to see dentists use their golfing skills to support a vital cause for all Canadians," said DCF chairman, Dr. Gordon Thompson. "We'll hope for an ace next year."

A hole-in-one would have produced \$1,000,000 for the golfer and DCF would have seen \$300,000 added to its treasury for ongoing programs. ■

Amalgam, New Graduates and Third Party Plans Highlight Annual Meeting

The 27 members of CDA's board of governors dealt with a heavy agenda during their annual meeting, held prior to the CDA Convention in Ottawa on August 25 and 26, 1995.

Prominent Ontario Dentist and CDA Honorary Member Dies

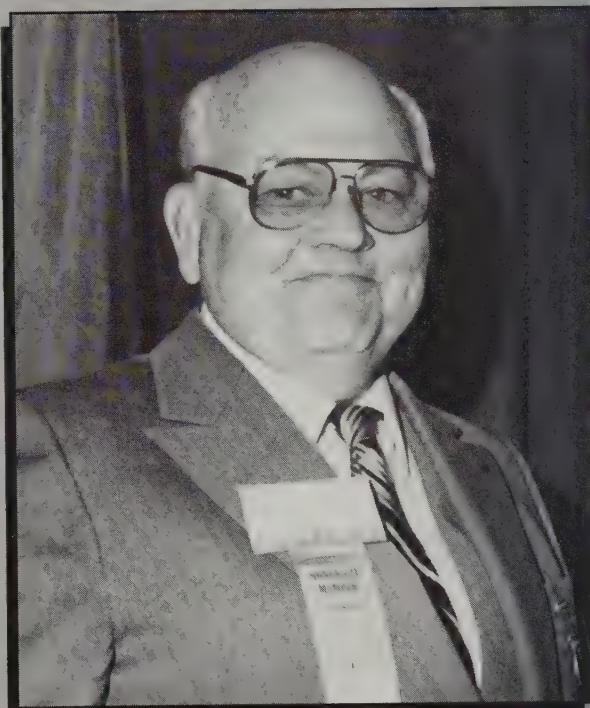
Dr. Bruce Taylor, a man recognized for service to his profession and his community, died in London, Ontario, June 25. He was 75.

Following his graduation from the University of Toronto's dental faculty in 1943, Dr. Taylor served for two years with the Royal Canadian Dental Corps. At the end of the Second World War, he entered practice in London, Ontario, in association with his father, Dr. Harold D. Taylor, a 1920 University of Toronto graduate.

When Dr. Bruce Taylor retired in 1988, it marked the end of 68 consecutive years of "Taylor" dental service to London.

Dr. Taylor was a past-president of the London and District Dental Society, past-president of the Ontario Dental Association, a board member of the Canadian Dental Association from 1967 to 1969, and served as CDA treasurer from 1970 to 1975.

In 1982 CDA awarded Dr. Taylor its highest award, honorary membership. ■



Dr. Bruce Taylor (1920 - 1995) was presented CDA's highest award, honorary membership, in 1982.

Highlighting the session was CDA's new Statement on the Ethical Considerations of the Replacement of Serviceable Amalgam Restorations. The statement's preamble stresses that treatment must be based on a sound foundation that reflects scientifically-based education and training, and it contains specific recommendations with regard to amalgam safety and replacement.

In response to growing concerns about the changing role of third-party dental plans, the board also established the terms of reference of the new steering committee on dental benefits issues. The establishment of this eight-person committee fulfils the strategies developed during the June 23-24 na-

tional conference on third-party dental plans. A new ad hoc committee for new dentists that will assess the needs of recent graduates and work toward development of new student programs also received approval by the board of governors.

More information about these and other proceedings of the annual meeting may be found in the September/October issue of CDA members' newsletter, *Communiqué*. ■

OBITUARIES

Brandell, Dr. Donald (Wylie): A 1976 graduate from the University of Alberta's faculty of dentistry, Dr. Brandell specialized in endodontics and practiced in Van-

couver, B.C. He died August 20 at the age of 43. A Scholarship fund will be established to help underprivileged talented athletes the opportunity to achieve their goal. Donations may be made to the Wylie Brandell Scholarship Fund. #221 — 650 W. 41st Ave., South Tower, Vancouver, B.C. V5Z 2M9. Please post date cheques to January 1, 1996.

D'Anjou, Dr. Jacques: A 1958 graduate from the University of Montreal's faculty of dentistry, Dr. D'Anjou practiced in Ste-Agathe-des-Monts for over 30 years. He died on April 15.

Kapach, Dr. J.M.: A 1970 graduate from the University of Alberta's faculty of dentistry, Dr. Kapach died July 28, 1995.

Dental Officers Graduate at Base Borden

Graduation ceremonies for nine Dental Officer Training Plan (DOTP) candidates were held at Canadian Forces Base Borden August 4.

The nine students, representing eight of Canada's 10 dental faculties, were each presented with a certificate of

graduation by Brigadier-General V.J. Lanctis, director general of dental services.

DOTP is a Canadian Forces program that subsidizes the educational and living expenses of participating dental students. On completion of their third or fourth year of dental school, the students attend an intensive five-

week course at the Canadian Forces Dental Services school at CFB Borden to familiarize them with administrative procedures and mobile field dental environments.

Graduates of the program are employed in Canadian Forces dental clinics for three or four years of obligatory service. ■



Brig.-Gen. V.J. Lanctis presents 2nd Lieut. N.M. Adams (right) of the University of Montreal with the Honor Candidate Trophy for the highest standard of excellence in academic, professional and military endeavors.



2nd Lieut. D.G. Gouett of the University of Toronto receives the Field Exercise Trophy for his leadership skills during military exercises.

Milburn, Dr. W.B.: A life member of the Canadian Dental Association, Dr. Milburn graduated in 1926 from the University of Toronto's faculty of dentistry. He died earlier this year.

Leong, Dr. James G.: Born in China, in 1948, he graduated from the University of British Columbia's faculty of dentistry in 1974 and then practiced in Vancouver, B.C. He died August 26, 1995.

Wilson, Dr. Norman A.: He died on July 23, 1995. Dr. Wilson, a graduate from the University of Alberta's faculty of dentistry in 1963, practiced in Kamloops, B.C. until he retired earlier this year. An annual bursary at the University College of the Cariboo Horticultural Department has been established in his honor.

LIBRARY PACKAGE

The Library Package or "Search of the Month" for October is **MYOFACIAL PAIN SYNDROMES**. This package contains more than 20 dental articles and is available to members, from the CDA Resource Centre, for a cost of \$5, plus applicable taxes. It can be ordered by calling the CDA Library at 1-800-267-6354 extension 223.

New Acquisitions

Each of the following can be borrowed by CDA members for a \$5 shipping fee.

Carlson, E.R. [editor]. Comprehensive management of salivary gland pathology. *Oral and Maxillofacial Surgery Clinics of North America*. August 1995.

Palacci, P. *Optimal implant positioning and soft tissue management for the Brane-mark system*. Quintessence, 1995.

Segerdal, M.J.N. *Quality acceleration in hygiene and operative*. [video and workbook]. PIBL Publishing, 1995.

Dental Health Video Sources. *The skills of daily mouthcare*. [Video] 1990.

Dentistry Anyone?

Individuals concerned about the future of Canadian dentistry may be interested in this photo of a rural "dental office," which was taken by a Canadian tourist in South China last summer. We think the umbrella is a nice touch on a hot day, and assume the parking of bicycles is free. ■



LISTERINE

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DOSAGE: Rinse full strength with 20 mL for 30 seconds twice a day.

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Cool Mint Listerine: Clear, blue, cool mint flavoured liquid available in bottles of 250, 500, 750, and 1,000 mL.

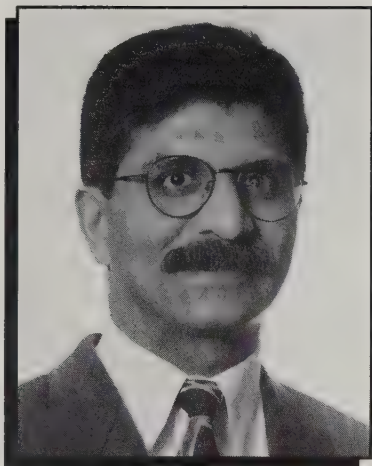
Fresh Burst Listerine: Clear, green, mint flavoured liquid available in bottles of 250, 500, 750, and 1,000 mL.



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Creating Value for Your Staff

Imtiaz Manji, B.Sc.

Principal of ExperDent

Last month, creating value for patients was the focus of this column. This month we turn the discussion towards creating value for staff, an area which is handled smoothly by some dentists but, unfortunately, neglected by others. The truth of the matter is that the gateway to strong dentist-patient relationships is strong dentist-staff relationships. When reading through this article, stop to consider how you measure up. Are you providing your staff with real value that will turn them into long-serving employees, or does your practice merely represent a job that could be easily dropped at the first sighting of something better?

Points of Reference

How do you create value for your staff — your best investment but one which needs your ongoing attention and nourishment if it's going to provide a good return? In general, you want to make sure that you're providing the tools for them to do their jobs well. Take stock of whether your working environment is contributing to or hindering their success. Ask yourself whether you have the right infrastructure in place — from efficient telephone and computer systems to a private area where they can make collections calls

without being overheard by visiting patients. Once you've laid the foundation for a successful working environment, you can start to create value for your staff. There are many ways to achieve this, but the underlying motivators are the same. You want to convey to your staff, each and every day, that your practice is *the* practice for them to call "home." To do this, you need to provide effective leadership, fair compensation and benefits, appreciation and acknowledgement, proper training, opportunities for growth, communication, and integrity.

Effective Leadership

When I talk about effective leadership, I don't mean that dentists have to get involved in the nitty-gritty details of each and every aspect of the practice. That would be both impossible and undesirable. Leadership is more global and visionary, and involves the ability to move people to act in particular directions and for particular purposes. The leader sets the agenda in a sense, and the team collectively carries it out. In fact, good leaders lead others to become leaders in their own right.

Signs of effective leadership include filled schedules, patients who pay according to the finan-

cial policies, and ongoing patient education about preventive hygiene. The dentist, in his or her contact with patients, should emphasize the importance of each of these areas and then pass the "torch" over to his or her staff, who are responsible for accomplishing each goal. For instance, the team member at the front desk may be the one who physically makes a departing patient's appointment, but it is the dentist who creates the need for this. The same goes for the hygiene department; the dentist must communicate the importance of dental hygiene to patients if they are to embrace the preventive philosophy.

Dentists who lead well will be rewarded with a team of accountable leaders, the kind of people who don't have to be asked to stay late to ensure the appointment book is in order for the next day. They wouldn't dream of going home until the job is done. Keep in mind that you must always lead by example, be it staying behind to nurture the schedule or arriving promptly for work. If you take off the minute your last patient has left the operatory or arrive late for the start of your day, you can't expect your staff to do much better.



Fair Compensation and Benefits

Money certainly isn't everything to most employees, but it does pay the bills. Making sure that you are compensating your staff properly means setting salaries according to the "going rates" in your region for their particular job, experience level and length of service. When you're setting salaries, you have to do your homework; your salary structure should be based on a combination of informed insight into what comparable practices are offering (the marketplace reality), an objective assessment of what you can provide (economic reality) and your desire to pay your team well (emotional reality). In a good practice, all three realities are given respect and fair weight.

You must also recognize that it isn't the responsibility of staff members to come to you for discussions about performance evaluations. Make it clear (a good place is in your policy and procedures manual) that these will occur on a regular basis — be it every three, four or six months, etc. — and will follow an organized format (to aid the interaction). This forces both you and the individual employee to sit down and discuss how things are going, and allows any problems to be worked out. (The last thing both of you need is to wait for an annual review to do any necessary mending.) You should also shy away from tying the performance evaluations to a salary review. A performance review should be just that — an opportunity to give employees regular feedback. And because an excellent review may not pave the way for an automatic raise — particularly if the practice can't afford it, or if a raise was recently given — linking the two just confuses matters.

Appreciation and Acknowledgement

I mentioned above that money isn't everything — and it's not. In a recent survey published in *Canadian Manager*, 47 per cent of

upper management ranked praise and recognition as most important in keeping employees satisfied, followed by promotions (26 per cent); working environment (nine per cent); job security (nine per cent); compensation and benefits (seven per cent); and other (two per cent).

Employees need to be told that they're doing their jobs well (if in fact they are), and that they play an important role in the success of the practice. Don't save your compliments or praise for the times when they go the extra mile (staying late, coming in early, etc.). Reinforce and respect each of them for doing what they normally do, and don't show favoritism. If you're generally quite silent and have decided to become more verbally demonstrative, let your team know that you want to acknowledge them and will be making an effort to do so. Otherwise, they might be suspicious of this out-of-character behavior. Recognition provides your team with a sense of pride about their work, and that pride goes a long way to keep staff — and in a domino-like-fashion, patients — happy.

Although you should "catch" good behavior whenever you spot it and tell your team that they're doing well, the fact is you're only one person. Ensure that there are other ways for your team to get feedback through self-monitoring systems. If your team can see filled schedules, a solid referral rate, a collections department with a manageable accounts receivable, and high case acceptance (to name but a few areas), they will know that they're doing something right.

Proper Training

Your staff may have the appropriate credentials and/or experience to thrive in a dental environment, but do they have what it takes to make it in *your* dental environment? Each practice is unique and therefore requires some degree of training and orientation for new employees. "Grooming" new employees

from the start is well worth the time because it will save your practice from wasting time in the future. As an adjunct to your orientation, you should have a written policy and procedures manual so that staff can refer to it for clarification on everything from scheduling absences to appropriate attire.

Keep in mind as well that improper training can lead to high staff turnover. Make sure you analyze the reasons staff leave. Often it may be unrelated to training — they're moving, going into business for themselves, etc. — but it is possible that they didn't feel properly oriented at your practice and they've decided to join the dentist down the street.

Opportunities for Growth

Stagnation and boredom begin a slippery slope, the runaway effects of which are difficult to reverse. No matter what the profession, people need to feel challenged and stimulated. An excellent way to achieve this is to allow employees to participate in professional development, and to convey to them that you back their efforts to grow. Encourage your staff to attend continuing education courses, and provide them with books and other materials to allow them to grow in their positions.

If they decide they want to explore other jobs within the dental field, don't discourage it. You'll either end up with dissatisfied employees who stay in the practice, or lose out on re-hiring those individuals who take their upgraded skills elsewhere. Many talented dental assistants have gone on to become equally competent dental hygienists, thanks to the support of practice colleagues and dentists.

Communication

Amazingly, the large umbrella term of communication, though bounced around virtually every sector of the economy, still eludes some dentists. To their own demise, they ignore human resources professionals and management consultants. If staff

meetings are held at all in such practices, they don't start on time, there is no agenda or carry through, and when the time-waster wraps up, people are left unmotivated.

Practices that have effective two-way communication hold regular, productive staff meetings, have staff who are comfortable presenting their ideas in a non-threatening environment, know how to map out and achieve their goals, and are characterized by dentists who have mastered that most precious of all communication skills, the ability to listen. Staff want to have their voices heard, considered, and acted upon when appropriate.

Sharing of Information

One of the most important keys to success in any business is making employees part of the process. This is the only way that they are able to participate in effective, results-oriented ways.

Give your dental team the opportunity to get a bird's eye view of the practice's production and how patient flow, collections, downtime, case acceptance, etc. impact on this figure. For instance, it doesn't hurt to explain to them that your overheads are 100 per cent until you break even, and that one hour of downtime affects your bottom line. The "straight goods" allow your staff to understand and appreciate many of the managerial decisions that are made, and ignites them to respond accordingly in whatever way they can. If things aren't going so well, your staff can brainstorm with you for ideas about how to improve matters. Acting as a lone ranger won't get you anywhere. Alternatively, if the practice is flourishing, the information to back this up will give your team the opportunity to momentarily pat itself on the proverbial back, and then identify elements that can keep your practice thriving well into the future.

Integrity

The points outlined above, though important, will be for naught if you don't display integ-

riety. Integrity must be demonstrated in all practice relationships: doctor-patient, doctor-staff, staff-patient, staff-staff. Your staff must feel — and know — that the practice is providing quality dentistry to patients in an environment which boasts the highest ethical standards; that the philosophy of excellence in patient care is shared among all staff; and that respect and trust are among the foremost principles underlying the practice. You should also make sure that you're taking the time to do your staff's dentistry. As ambassadors of the practice, it doesn't bode well if your staff is going elsewhere to have their dental needs met.

Summary

Your staff are the agents of success in your practice. It is through their collective, quality

efforts that your vision comes to fruition. Treat this investment in human resources with care and nourishment, and you'll be well on your way to establishing a thriving dental practice — one which can claim that not only its patients, but its staff as well, are its biggest fans. ■

For more information on managing staff, please refer to the following:

1. Incentives & Profit Sharing, JCDA 57:383-386, 1991, Mobilizing Your Workforce, JCDA 57:779-780, 1991
2. Incentives and Profit-Sharing Revisited, JCDA 57:839-842, 1991
3. Leadership: The Essential Ingredient for Practice Success, JCDA 58:703-704, 1992
4. Hiring the Best and the Brightest JCDA 58:793-794, 1992
5. Fair Pay and Then Some: How to Retain Your Staff, JCDA 58:895-896, 1992.



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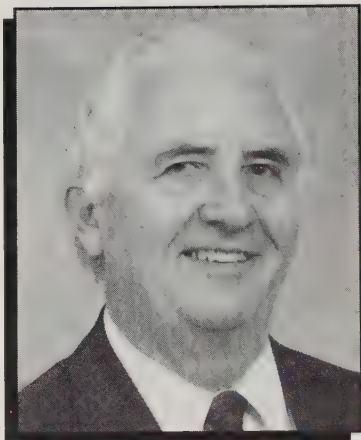
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JOURNAL

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 Octobre
 1995
 Vol. 61
 No. 10



Your Insurance And Investment Organization Restructures For The Future

Dr. James Wright, President of CDSPI

As you see, I have referred to Canadian Dental Service Plans Inc. in the headline of this article as "your" insurance and investment organization. I would like to briefly explain why the company is in fact yours, so you will have a genuine stake in learning about recent developments in CDSPI's structure.

Many dentists still view CDSPI as an independent organization, an entity unto itself. The truth of the matter is that CDSPI is owned by the Canadian Dental Association and nine provincial dental associations. In effect, that means CDSPI is owned by the dentists of Canada. The only reason it's separated from the associations is because the dental profession recognizes insurance and investments as important enough programs to warrant management and monitoring by a specialized organization. For all intents and purposes, you can think of CDSPI as a CDA and co-sponsoring provincial associations company.

In other words, if you contribute membership dues to the Canadian Dental Association or your provincial association (Quebec excluded) then CDSPI is your company.

Obviously, you would want to know that the company that administers your financial programs is itself run in a business-like manner. To that end, CDSPI changes with the times — evolving, as any vibrant company should. On August 26, 1995, CDA and co-sponsoring provincial associations approved a major restructuring of CDSPI at the corporation's annual meeting in Ottawa.

In the lean and mean '90s a great many corporations have streamlined their operations to run more economically, and become more responsive. Effective November 17, 1995, Canadian Dental Service Plans Inc. joins the ranks of these efficiency-minded companies.

Formerly, CDSPI's corporate structure involved an eight-member board of directors, a three-member management committee, four provincial "observers" to the board and a meeting chairman — all 16 people being dentists. Now this structure is being replaced by a five-member board of directors, composed of four dentists and one non-dentist.

Before I explain the change, I want to emphasize that the former structure worked extremely

well. For its time, the board of directors and management committee served the needs of the profession very effectively. The current restructuring is an evolutionary phase that builds on past success to meet future demands.

The change was made to emphasize the business aspect of the corporation, reduce costs, increase efficiency, and make CDSPI even more responsive to dentists' financial needs.

The most profound difference centres around regional representation. Previously, the board of directors included members from all of Canada's regions. Under the new structure, board members are appointed purely on the basis of their professional background and business experience, without regard to their home province. It's a change from a politically oriented structure to a business-oriented structure.

Voices from all regions will still be heard. A nominating committee will recommend board candidates at the CDSPI annual meeting. That meeting hosts voting members, from nine provincial associations and CDA, who will consider the committee's recommendations and elect the board of directors

TRANSITIONS

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We are pleased to announce that ExperDent and Scotiabank have teamed up to offer the dental community an unparalleled package of practice management and financial support. Scotiabank is one of Canada's leading financial institutions and ExperDent is one of the country's leading practice management consultants.

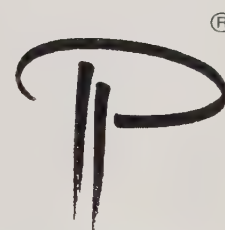
A practice transition is a time when you need an experienced transition team like ours on your side. Here are a few examples of where we can be of service:

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- *If you want to sell 100% of your practice right now*
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- *If you want to grow your practice, re-equip, modernize, move or computerize*



These cases raise critical issues: enhancing and protecting practice value, sound business planning, negotiations, contracts, reliable financing at competitive rates, banking services, leasing arrangements...We can help you to deal with these efficiently, effectively and economically.

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Seminar

What's Your

Periodontal disease is a leading cause of adult tooth loss. PSR, a new Periodontal Screening and Recording method, means early detection to reduce the risk and improve your patients' dental health.

Why has the CDA endorsed PSR?

A Preventative periodontal care is an important issue for Canadian dentists. As an integral part of our professional services program, the Canadian Dental Association and the Canadian Academy of Periodontology, with generous sponsorship from Procter and Gamble Inc., has created a series of seminars to introduce a new periodontal evaluation system that quickly screens patients for periodontal disease and records the results simply and easily. PSR is just one more way CDA is helping you enhance patient care and find new tools and techniques to support periodontal treatment.

How can I learn more about PSR?

A You and your staff can quickly learn more about this simple procedure at CDA's PSR Seminar. In addition to training by a periodontist appointed by the Canadian Academy of Periodontology, you'll receive a comprehensive starter kit. This kit includes recording stickers, helpful in-office marketing tools and background information that will help you integrate PSR into your practice and assist you with patient education.

How long does it take to perform PSR?

A Thanks to the special probe and simple scoring method, the procedure usually takes just 2-3 minutes. That's why it's easy to include PSR in all routine exams on adult patients.

What are the benefits for my patients?

1 Early detection

By evaluating all sites of potential risk, PSR is a highly sensitive technique that helps you detect periodontal diseases early to simplify treatment and offer patients greater peace of mind.

2 Speed

PSR takes just a few minutes to perform and can be added to routine exams without lengthening exam time.

3 Simplicity

Easy to administer and understand, PSR and its simple scoring system can easily be explained to patients to enhance awareness.

4 Cost Effectiveness

By using a simple periodontal probe designed for the PSR method, there is no expensive equipment to buy. The specially designed probes are available from a variety of suppliers.

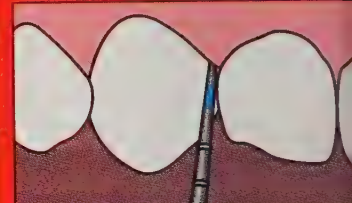
5 Recording Ease

PSR requires the recording of six scores, one for each sextant of the mouth. No extensive charting or narrative is required, which means more time for patient interaction.



CODE 0

Coloured area of probe remains completely visible in the deepest crevice in the sextant.



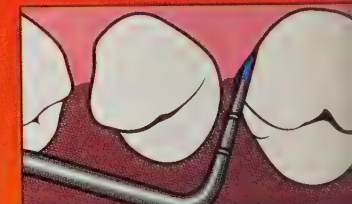
CODE 1

Second half of probe remains completely visible in the deepest probing depth in the sextant.



CODE 2

Third half of probe remains completely visible in the deepest probing depth in the sextant.



CODE 3

Coloured area of probe remains partially visible in the deepest probing depth in the sextant.



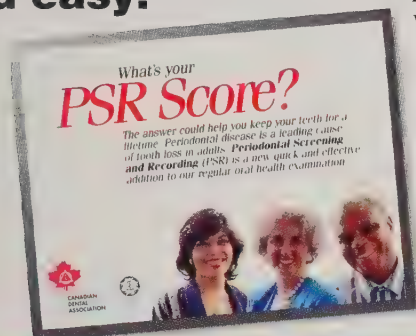
CODE 4

Coloured area of probe disappears completely, indicating a probing depth of greater than 5.5 mm.

CANADIAN
DENTAL
ASSOCIATION

PSR Score?*

CDA's PSR Seminar makes early detection and recording simple and easy!



Through this seminar, you'll learn a fast and easy way to diagnose potential periodontal problems with the help of a specially designed colour-coded probe. You'll also learn how and when to advise periodontal care and when to schedule a full mouth periodontal examination and treatment planning.

Plan to join us today...

In order to introduce you to this essential periodontal diagnostic procedure, CDA has planned a number of seminars to be held in major centres across Canada. In addition to step-by-step training, dentists attending the seminar will receive a comprehensive PSR information kit.

But seating is limited, so don't delay. Complete and return the registration form below today or call 1-800-657-5688 and learn how the PSR program will help educate your patients about the risk of periodontal disease, simplify the recording process and save you time. Put PSR to work for you.



* Periodontal Screening and Recording, PSR, and the associated logotype are trademarks and servicemarks of the American Dental Association and related to a program jointly endorsed by the Canadian Dental Association and the Canadian Academy of Periodontology.

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PSR Seminars, Fall of 1995

Vancouver, BC	September 28 1995	Brandon, MB	October 12 1995	Sudbury, ON	November 2 1995
Edmonton, AB	September 28 1995	Toronto, ON	October 12 1995	North York, ON	November 9 1995
Winnipeg, MB	September 28 1995	Windsor, ON	October 12 1995	Sault Ste Marie, ON	November 9 1995
Toronto, ON	September 28 1995	Charlottetown, PE	October 12 1995	Kelowna, BC	November 16 1995
Hamilton, ON	September 28 1995	North Bay, ON	October 19 1995	Peterborough, ON	November 30 1995
Moncton, NB	September 28 1995	Thunder Bay, ON	October 19 1995	Toronto, ON	November 30 1995
Halifax, NS	September 28 1995	Fredericton, NB	October 19 1995	Quebec City, QC (French)	November 30 1995
Victoria, BC	October 5 1995	Saskatoon, SK	October 26 1995	Val D'Or, QC (French)	November 30 1995
Calgary, AB	October 5 1995	Kingston, ON	October 26 1995	Montreal, QC (French)	December 7 1995
London, ON	October 5 1995	Oakville, ON	October 26 1995	Rimouski, QC (French)	December 7 1995
Montreal, QC (English)	October 5 1995	Prince George, BC	November 2 1995	Trois-Rivières, QC (French)	December 14 1995
St. John's, NF	October 5 1995	Peace River, AB	November 2 1995	Sherbrooke, QC (French)	December 14 1995
Regina, SK	October 12 1995	Ottawa, ON (English)	November 2 1995		

Registration Form

Seminar location: _____ Séminar date: _____

Pre-registration is required. There will be no on-site registrations. Register early since enrollment is limited.

Name: _____

CDA Membership #: _____

Street: _____

City: _____

Prov.: _____ Postal Code: _____

Office Tel: _____ Residence Tel: _____

A receipt for the above registration fees will be issued to: _____

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Credit Card #:

Signature: _____ Expiry date: _____

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Allied staff or spouse of member dentist:	\$25	\$
Allied staff or spouse non-member:	\$35	\$
Subtotal		\$
GST 7% of Subtotal (#R106845209)		\$
Total		\$

Sign-in and light supper and refreshments at 6:30 pm. Seminar presentation at 7:30 pm to 9:30 pm.

Register Today!

Mail or Fax registration form and payment to:
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Call toll-free 1-800-657-5688 or fax 1-613-523-7736

Confirmation of your enrollment will be received by mail. Cancellation policy: Full refund 21 days prior to seminar. CE Credits will apply subject to Provincial approvals pending.

annually. Control of all plans and programs still rests with CDA and the co-sponsoring provincial associations, as they continue to approve changes to all programs.

To ensure continuity, two members of the previous board will serve on the new one: Dr. W.G. Leggett, a member of the current board, and myself, Dr. J.N. Wright, president of CDSPI. The other two dentists on the new board are Dr. T.C. Larder and Dr. R.R. Schiewe. The non-dentist member is Mr. R.L. Dunn, president of Canadian General Insurance. Board members, who

are appointed for a one-, two- or three-year term, may be considered for re-appointment.

Having an insurance company president on the board of directors will enhance CDSPI's contacts in the insurance industry. It means we can be even more effective in improving our existing plans and potentially adding new ones.

To sum up, the previous corporate structure performed admirably in making CDSPI a first-rate professional organization. As CDSPI matured, its owners — CDA and co-sponsoring provincial associations — felt confident

that the company could continue to succeed with a more streamlined operation. Today, that means lower costs and increased efficiency. Tomorrow, you can expect financial programs that will continue to meet the insurance and investment needs of the dental profession in Canada.

Your company, Canadian Dental Service Plans Inc., will still provide the same dependable programs and excellent service, only now CDSPI has a more efficient governance structure. ■

CDA RETIREMENT SAVINGS PLAN

✓ Check Out Superior Investment Performance

CDA Fund Performance (for periods ending August 31, 1995) [†] (Checks indicate Superior Performance Compared to Industry Averages*)								
CDA Fund	1 Year		3 Year		5 Year		10 Year	
	CDA	Other*	CDA	Other*	CDA	Other*	CDA	Other*
Aggressive Equity	4.0%	8.9%	n/a		n/a		n/a	
Common Stock	5.7%	5.8%	✓ 12.6%	11.9%	✓ 10.2%	9.4%	✓ 9.8%	8.0%
Balanced	✓ 9.1%	7.5%	8.5%	9.2%	9.6%	9.8%	✓ 9.3%	8.3%
Bond & Mortgage	10.6%	10.7%	✓ 6.9%	6.0%	✓ 10.5%	10.2%	✓ 10.1%	9.9%
Money Market	✓ 6.5%	5.9%	✓ 5.5%	4.9%	✓ 6.9%	6.5%	✓ 8.3%	8.0%
International Equity	✓ 7.2%	0.1%	n/a		n/a		n/a	
European	✓ 19.6%	2.4%	n/a		n/a		n/a	
Pacific Basin	✓ 3.5%	-10.7%	n/a		n/a		n/a	
Emerging Markets	✓ -17.3%	-22.7%	n/a		n/a		n/a	

[†] CDA figures indicate annual compound rate of return with all fees deducted. The figures are historic rates based on past performance and are not necessarily indicative of future performance.

* Comparison performance figures are Globe and Mail averages for the range of similar funds offered in the marketplace before sales charges, as published in the September 21, 1995 issue.

For current unit values and GIC rates call CDSPI toll-free at: 1-800-561-9401, ext. 525.
(Metro Toronto call: (416) 296-9401.)



SELF-LEARNING SELF-ASSESSMENT

The SLSA Program is published as a monthly feature in the *Journal of the Canadian Dental Association* as a resource for dentists wishing to enhance their dental knowledge and expertise. It is intended as a vehicle for self-learning and self-assessment. The program is based on a series of 20 questions, answers, rationales, references, reversal questions, and reversal answers, followed by an annual 15-question quiz. The 1995-96 quiz will appear in the June 1996 issue of the *Journal*. Answers to the quiz will be published in the August 1996 issue. Dentists who complete the quiz may be eligible to receive continuing education points, and their names will be forwarded to their provincial licensing bodies for consideration.

Questions 1 through 5 are a repeat of the questions that appeared in the **September** issue of the *Journal* accompanied with correct answers, the rationale and specific references. Question 6 through 10 are new questions — watch for their answers and rationale next month. Keep all copies of the *Journal* so you can correctly respond to the June 1996 quiz.

QUESTION 1

In the preparation of a Class II cavity in a mandibular molar for an amalgam restoration you find that caries is deep and has destroyed the pulpal axial line angle. You would place a

- A. liner of calcium hydroxide to stimulate reparative dentin.
- B. base to give thermal insulation.
- C. base to restore the axial line angle.
- D. base to re-establish a flat floor for amalgam condensation, strength, and longevity.
- E. All of the above.
- F. None of the above.

ANSWER: F

RATIONALE:

Although in the past clinical recommendations were for the use of a calcium hydroxide liner to stimulate dentin of repair, there is no proof that this occurs. Calcium hydroxide is a useful bacteriocidal agent, however, and can be used for this purpose if it would appear clinically necessary to retain minimal residual caries to avoid a pulp exposure. None of the bases presently used is a good thermal insulator in a thickness less than 2 mm. Whilst a base of zinc-oxyphosphate, polycarboxylate or glass ionomer cement can and will restore the axial line angle and provide a flat floor to re-establish an ideal Black Class II cavity outline form these approaches are now considered dated. Recent studies have shown that unbased restorations are much stronger, decrease the potential to amalgam fracture and

increase longevity. Use of modern etchants, primers and resins causes the formation of a resin impregnated layer of dentin on the cavity floor preventing postoperative sensitivity to thermal stimuli and microleakage. Such "hybridisation" of dentin should now become the modern treatment approach to the clinical problem outlined.

REFERENCES:

- (1) Leinfelder, K.F. Changing Restorative Traditions: the use of bases and liners. *JADA* 125:65-67, 1994.
- (2) Cox, C.F., and Suzuki, S. Re-evaluating pulp protection: Calcium hydroxide liners vs cohesive hybridisation. *JADA* 125:823-831, 1994.
- (3) The Oral Care Report Ed. G. Nikiforuk, Vol. 5 March, 1995.

QUESTION 2

When a posterior composite resin restoration has a sealant applied to it, the restoration over time will show

- (1) more occlusal wear.
- (2) less occlusal wear.
- (3) improved marginal integrity.
- (4) less staining of the margins.
- (5) more bacterial penetration.

- A. (1) (3) (5)
- B. (2) (3) (5)
- C. (2) (3) (4)
- D. (1) (4) (5)

ANSWER: C

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RATIONALE:

In a recent study (Dickinson and Leinfelder 1993) Class I and Class II cavities were prepared with 90 degree cavosurface margins. The teeth were then restored with composite resin. After finishing to anatomic form, half of the restorations were then cleaned and after etching with 37 percent phosphoric acid for 30 seconds a sealant was applied. Evaluations over five years have shown a marked improvement in wear resistance in the restorations when a sealant was applied. In addition, the marginal integrity was improved and bacterial penetration and staining reduced.

Multiple microcracks and fine fracture lines are commonly found on occlusal surfaces of posterior composite resin restorations. The application of a low viscosity surface penetrating sealant seals these cracks and deficiencies. The technique is simple and greatly adds to the longevity of composite resin restorations in posterior teeth where marginal defects are still the main cause of replacement.

REFERENCES:

- (1) Dickinson, G.L. and Leinfelder, K.F. Assessing the long term effect of a surface penetrating sealant. *JADA* 124:68-72, 1993.
- (2) Quist, V. Resin restorations: leakage, bacteria, pulp. *Endod Dent Traumatol* 9:127-152, 1993.

QUESTION 3

Which of the following characteristics of cut dentin will affect local adhesion in dentin bonding restorative materials?

- (1) Smear layer.
- (2) Tubule density.
- (3) Tubule length and size.
- (4) Degree of sclerosis.

- A. (1) only.
- B. (2) and (3)
- C. (2) (3) (4)
- D. All of the above.

ANSWER: D

RATIONALE:

The smear layer produced on cutting enamel and dentin contains hydroxyapatite crystals and denatured collagen. It is 1-5 microns thick. Although part porous, the smear layer reduces dentinal fluid flow from the tubules, thus decreasing postopera-

tive sensitivity and providing a drier surface to help adhesion. The smear layer, however, is weakly attached to the underlying dentin and for this reason, new adhesives partially remove and penetrate this layer. In addition, since dentin becomes "wet" with dentinal fluid, the new bonding agents include hydrophilic monomers to penetrate the moisture layer. Another major factor affecting dentin adhesion is the number of tubules available for mechanical retention. Furthermore, the length and orifice size of the tubules will also affect the end result. Since age affects sclerosis of dentin and therefore numbers of available dentin tubules this should be taken into account when dentin bonded restorations are being considered in the older patient especially in the Class V restoration.

REFERENCES:

- (1) Heymann, H.O. and Bayne, S.C. Current concepts in dentin bonding: focusing on dentinal adhesion factors. *JADA* 124:27-42, 1993.
- (2) The Oral Care Report Ed. G.Nikiforuk, Vol. 4., June 1994.

QUESTION 4

Crowding of mandibular anterior teeth is progressive and continues until

- A. eruption of the third molars.
- B. age 25-30.
- C. age 30-40.
- D. age 40-50.
- E. age 50 and beyond.

ANSWER: E

RATIONALE:

Recent studies have shown little relationship between eruption of third molars and crowding of the mandibular incisors. The mean age for eruption of third molars is 20 years but mandibular anterior crowding continues long after this. Little et al (1988) have reported that the process of arch constriction and crowding of incisors can continue beyond 50 years. Even patients with anterior spacing can show crowding of incisors as the arch length and intercanine width constriction progresses into middle age (Little 1989). Removal of third molars to prevent incisor crowding on the theory that it will reduce interdental forces, is thus invalid.

REFERENCES:

- (1) Southard, T.E. Third molars and incisor crowding when removal is unwarranted. *JADA* 129:75-79, 1992.
- (2) Little, R.M., Reidel, R.A., Arthur, J. An evaluation of changes in mandibular anterior alignment 10-20 years post retention. *Am J Orthod* 93:423-428, 1988.
- (3) Little, R.M., Reidel, R.A. Post retention evaluation of stability and relapse. Mandibular arches with generalized spacing. *Am J Orthod* 95:37-41, 1989.

QUESTION 5

Ultrasonic bacterial debridement is a periodontal treatment which uses

- (1) surgical curettage.
- (2) pocket irrigation.
- (3) antimicrobial agents.

- A. (1) and (2)
- B. (2) and (3)
- C. (2) only
- D. All of the above.
- E. None of the above.

ANSWER: D

RATIONALE:

Traditional periodontal therapy aims at resolution of the inflammatory lesion in the periodontal tissues. Such treatment involves the elimination of soft and mineralized microbial deposits on the tooth surfaces by scaling and root planing. The ideal result of periodontal treatment would be regeneration of lost attachment apparatus by the formation of new cementum, periodontal ligament and alveolar bone.

The technique of ultrasonic bacteriocidal debridement introduces surgical curettage in combination with irrigation of the pockets with antimicrobial agents. The benefit of this method of subgingival irrigation for advanced cases of periodontal disease is that the subgingival periodontal pathogenic organisms are suppressed to the advantage of postoperative healing.

Rosling et al (1986) report that use of this technique along with provide-iodine resulted in either gain of clinical periodontal attachment or prevention of loss when compared to treatment by surgical

access or debridement without use of the antimicrobial agent. Other antimicrobials such as chlorhexidine or cetylpyridine are equally effective.

REFERENCES:

- (1) Genco, R.J. Using antimicrobial agents to manage periodontal diseases. *JADA* 122:122-131, 1991.
- (2) Rosling, B.G. Slots, J., Christersson, L.A., Grondahl, H.G., and Genco, R.J. Topical antimicrobial therapy and diagnosis of subgingival bacteria in the management of inflammatory periodontal disease. *J Clin Periodontol* 13:975-981, 1986.

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CDA encourages Canadian dental licensing authorities to recognize the SLSA program as an appropriate and acceptable resource for dentists seeking to earn the continuing education credits required for the maintenance of licensure.

Currently, all 10 provincial licensing bodies — British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland — recognize the SLSA program for continuing education credits.

QUESTION 6

Drug concentration in the body varies according to

- A. dosage given.
- B. age of the patient.
- C. fat to lean body mass ratio.
- D. cardiovascular status.
- E. All of the above.

QUESTION 7

Which of the following artificial sweeteners are non-cariogenic and non-caloric?

- (1) Xylitol.
- (2) Saccharin.
- (3) Sorbitol.
- (4) Aspartame.

- A. (1) (2) (3)
- B. (1) and (3)
- C. (2) and (4)
- D. (4) only
- E. All of the above.

QUESTION 8

Terfenadine (Seldane)

- A. is an antihistamine.
- B. is metabolised in the liver.
- C. interacts with erythromycin.
- D. All of the above.
- E. None of the above.

QUESTION 9

Success of an endosseous dental implant is dependent upon

- (1) biocompatibility of the material.
- (2) design.
- (3) a period of non-function.
- (4) immediate loading.
- (5) prosthodontic treatment.

- A. (1) (2) (3)
- B. (1) (2) (4)
- C. (1) (2) (3) (5)
- D. (1) (2) (3) (4)

QUESTION 10

Which of the following are recognised as clinical characteristics of calcium hydroxide materials?

- (1) bacteriocidal to bacteriostatic.
- (2) high pH stimulates fibroblasts.
- (3) accelerates internal resorption after trauma.
- (4) adheres to vital dentin.
- (5) excellent for root canal medication.

- A. (1) (2) (3)
- B. (2) (3) (4)
- C. (1) (2) (5)
- D. All of the above.

(Answers to questions 6-10 will appear in next month's *Journal*.)

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Magnification Systems in Clinical Dentistry

John Kanca, DMD

Peter G. Jordan

Introduction

by John Kanca

How many times has it happened to you? It's a large lesion, deep interproximally. You have excavated for some time. Have you got it all? Man, it's tough to see between those first and second maxillary molars. Everything inside you is screaming just one thing. Get Closer. If I could just get closer I'd be able to see what I need to see.

The answer is simple. It's surgical magnification. For 12 years I have made use of surgical magnification and never for one minute have I regretted that decision. The use of magnification is one of the things that I feel are absolutely mandatory for any restorative dentist desirous of improving the quality of his/her own work. Magnification is critical to get yourself closer to the operating field. It opens up an entirely new world. It makes many things possible.

Have you ever gone on a bird watching walk? Or a whale watch? The veterans will all have in their grasp a set of binoculars. Binoculars will bring them closer to their interest. They will be able to identify that which they observe. They will see things they cannot see without the glasses.

Surgical magnification, as the phrase implies, is widely used in medical applications. One cannot watch a news program about surgery without noticing that the surgeons wear magnifying eye wear.

In medicine it has become a common practice, and in my opinion should be mandatory for the development curriculum of dental students.

Over the years I have owned several types of surgical telescopes and I feel especially comfortable with a couple of them. I have owned Designs for Vision glasses for the longer period of time and they have been excellent. In time the frames will tend to loosen and will need tightening. A more recent discovery has been the Surgitel glasses from General Scientific Corporation. These are slightly heavier than the Designs for Vision set but both have fixed convergence angles, which is a feature I prefer. Surgitel's interpupillary distance is the only adjustment needed and can be locked into place once accomplished. The Surgitel's have a wider field of vision and more flexibility in the working depth. Either, however, will provide the user with an amazing increase in the quality of vision information which can then translate into improved restorative quality.

In the past some clinicians have sought out the small inexpensive type of magnification. There is no comparison in the quality of optics to the newer surgical telescopes available today. Whichever type of glasses are finally decided upon, I cannot too strongly recommend their implementation into the daily restorative routine.

Selecting A Magnifying System

by Peter Jordan

In dentistry, two basic types of magnification systems are commonly used: single-lens magnifiers (clip-on or flip-up, i.e. jeweller's glasses) and multi-lens telescopic loupes.

Single-lens magnifiers produce what is known as dioptr magnification, which is really just another way to describe the lens's focal length. Dioptr magnifiers simply adjust your working distance to a set length. As the dioptr increases, the working distance decreases.

Several problems are associated with this type of magnification device. With a set working distance, there is no range, and no opportunity for movement. This creates difficulty in maintaining focus. Similarly, a set working distance requires a set working posture, which is likely to be ergonomically incorrect, and will eventually cause neck and back strain as well as poor posture. Dioptr magnifiers also provide poor image quality, which inhibits ability to provide enhanced work quality. These types of magnifiers should not be considered to be a true means of magnification.

True clinical magnification systems use multi-lens optics (telescopic loupes and microscopes). Because the general dentist's clinical use of microscopes is limited, they will not be discussed here.

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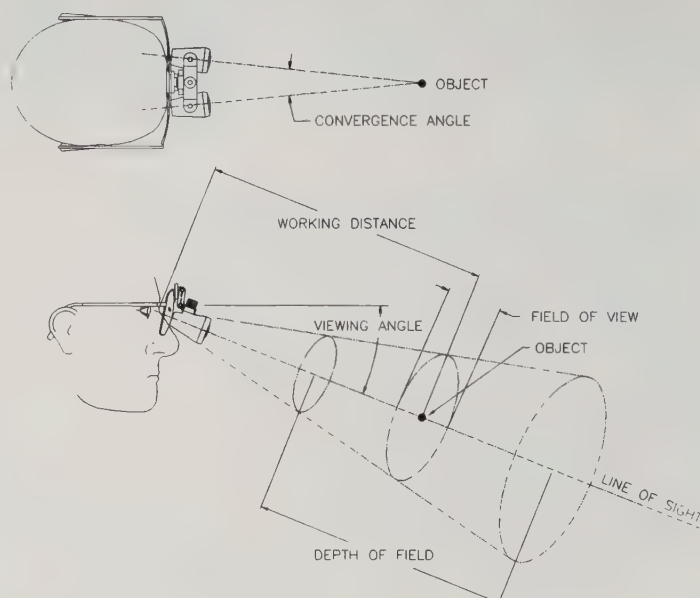


Fig. 1: Several key optical features, including working distance, working range, convergence angle, field of view, and viewing angle should be considered prior to purchasing a magnification loupe.

Telescopic loupes, however, offer the dental professional improved ergonomic posture as well as significant advancements in optical performance.

Selecting the proper magnification loupe requires some basic definitions and understanding of these key optical features (**Fig. 1**).

Working Distance: The distance measured from the eye to the viewed object.

Working Range (depth of field): The range distance within which the object remains in sharp focus.

Convergence Angle: The pivotal angle aligning the two oculars, such that they are pointing at the identical distance and angle.

Field of View: The linear size or angular extent of an object when viewed through the telescopic system.

Viewing Angle: The angular position of the optics allowing for comfortable viewing.

Working with telescopic loupes may feel somewhat strange at first. A two- to three-week adjustment period is typically required to develop the necessary hand-eye coordination. During this adjustment period, only routine examinations and recalls are suggested, although restorative procedures will become very comfortable in a short time.

Three brands of telescopic loupes are very popular in dentistry today: Dimension Three from Orasoptic Research, Surgical Loupes from Designs for Vision, and SurgiTel from General Scientific Corporation.

All models currently offered by Dimension Three and SurgiTel use what is known as Galilean optics, which provide the operator with a long depth of field. Designs for Vision offers models that use both Galilean and Keplerian optics. Although Keplerian optics are capable of offering higher magnification, weight can be a concern as magnification power increases. Galilean optics are preferred in dentistry, because they maintain a relatively wide field of view as magnification power increases.

In terms of working comfort, there is no need for dentists to use a magnification power beyond 5 Galilean or 4 Keplerian. Most dentists operate at between 2 and 3.5 (either Galilean or Keplerian).

Each of the five optical features defined above affects individuals in different ways, based on their working habits, physique and facial structure.

The average dentist works comfortably at a distance of between 10 and 13 inches. (Some older dentists have developed poor posture with age.) Many optical loupe

manufacturers provide various models set for specific working distances. SurgiTel, for example, offers near, mid-range and far-working distance options (**Fig. 2**). Each model accommodates a working range in which the viewed object will be in very sharp focus. For instance, the SurgiTel 215N has a working range (depth of field) of about nine inches.

While the operator's freedom of movement is relatively unrestricted, it is very important to understand that each individual's vision is limited to their own internal working range, which will not necessarily equal the available working range of the loupes. For example, you may only be able to maintain focus on an object within a six-inch range, even though the loupe itself has a nine-inch depth of field.

With any brand of loupe, the depth of field decreases as the magnification increases. Before you buy a loupe, it is imperative to take an accurate measurement of the distance from your eye to the working area, when you are in your most comfortable working position, before selecting the proper magnification power and model. The idea is to choose a system that conforms to you and your work habits, rather than one that requires you to conform to its particular idiosyncrasies.

The field of view may also vary depending on the design of the optics, the working distance model, and the magnification power. Due to their larger optics design, Dimension Three and SurgiTel loupes provide a wider field of view. Designs for Vision is designed with a smaller optics system, primarily to combat excess weight, but the field of view and the depth of field are somewhat restricted.

As with depth of field, when magnification increases, the field of view decreases. All of these three brands of loupes provide excellent image resolution. However, they may not provide equal operator comfort, depending on their adaptability to your most comfortable working position.

Operator comfort is extremely important in regards to maintaining proper posture and avoiding muscular and skeletal problems. One of the

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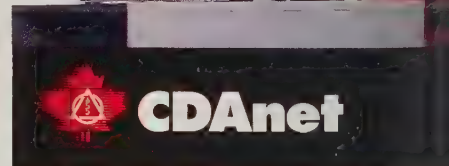
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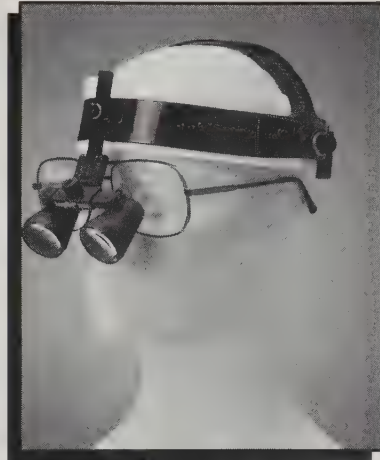
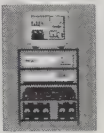


Fig. 2: Several loupe mount options are offered by SurgiTel and other suppliers.



Fig. 3: The ocular structure of the Design for Vision loupe is physically secured to the lenses of the glasses.



Fig. 4: Dimension Three offers a front-frame mounted ocular structure.

key features that allows the operator to maintain comfort is the viewing angle. It is beneficial to have the viewing angle of the loupes customizable to the individual practitioner. Your working posture is likely to change over time, and the loupe system must be adjustable to any posture changes.

The ocular structure of the Design for Vision loupe is small and light weight, and is physically secured to the lenses of the glasses (**Fig. 3**). The viewing angle, therefore, is locked into position, and can only be customized to the original operator's posture measurements. Dimension Three and SurgiTel's ocular structure are best described as front-frame mounted (**Fig. 4**). These systems offer pivotal angle adjustments that are user precise, but easily altered and locked into position based on the operator's comfortable working posture. SurgiTel is the only loupe to offer a vertical slide adjustment that further aids in custom viewing. When adjusted properly, front-frame mounted loupes maintain up to 90 per cent of the operator's peripheral vision.

The convergence angle also differs based on the brand of the loupe. Each ocular must be properly

aligned with its mate and pointed at a certain distance, otherwise headaches and dizziness are likely to occur. Both SurgiTel and Design for Vision preset this feature at the factory, while Dimension Three allows the operator to adjust it whenever necessary. A preset convergence angle may be more user-friendly, given that dentists are trained in dentistry, not optical design.

In addition to optical features and adjustments, several functional features are also clinically significant and should be addressed prior to purchasing telescopic loupes.

Interpupillary Distance (IPD) is a key adjustment that allows long-term, routine use of telescopic loupes. Some brands feature a preset IPD, which is measured at the fitting stage and then fixed into position at the factory. Others allow customizable IPD adjustment with simple finger touch controls (generally front-frame mounted designs). The ideal setting, as with binoculars, is to create a single image with an oval-shaped viewing area. If the viewing area is adjusted to a full circle, excess eye muscle strain would inhibit the ability to use the loupes for long

periods of time. Having an adjustable IPD also renders the loupes transferable to another operator in the event that higher magnification is desired.

The ability to maintain eye contact with the patient, watch for materials and instruments being passed into the procedure area, or read X-rays and/or charts all depend on the loupe's design and peripheral vision accommodation.

Front-frame mounted loupes allow up to 90 per cent of the operator's peripheral vision to be retained, and they can easily be flipped up, above the frame, allowing for a full facial view. This feature is ideal for patient discussions and consultations, before, during and after the procedure is complete. However, the front-frame mounted design is slightly heavier.

SurgiTel has overcome the excess weight of the front-frame design with a four nose-pad system that distributes the ocular weight evenly.

Inter-lens loupes (Designs for Vision) can restrict peripheral vision to as little as 10 per cent. Also, depending on the user's facial features (i.e. nose), the ocular lens may sit dangerously close to the eye itself. Even though this design weighs less, it is usually necessary to remove the loupes to view anything outside the working area.

All the loupes described in this paper are designed to be used with corrected vision. In other words, if you now wear prescription eye glasses or contacts while you work, that same prescription must be added to the loupes prior to attaining a focused image. Prescriptions for front-frame mounted loupes are easily installed by any optician. However, inter-lens loupes are manufactured with the prescription built into the optics.

Once you are comfortable with a loupe system, you most likely won't want to work without it. If, and when, your prescription changes, inter-lens loupes must be returned to the manufacturer for reconfiguration—a timely and costly adjustment.

An alternative to frame-mounted loupes are the headband-mounted models offered by many manufacturers. Headband-mounted loupes are very comfortable and allow the operator to use



his or her own prescription glasses while working. Peripheral vision is also well maintained with these loupes, and some offer a "flip-up" feature as well. Although some people feel that headband-mounted loupes are too intimidating to their patients, others prefer the medical appearance.

As with all other dental materials and equipment, cross contamination is of primary concern to both patients and the operator. Unfortunately, it is difficult to disinfect most magnification systems. SurgiTel is the only loupe reported to have completely sealed optics, which allow for efficient disinfection (i.e. wipe down) and rinsing under running water. Many other loupes are unsealed, and moisture can leak into the optics themselves. Regardless of the brand of loupe you buy, you should refer to the manufacturer's instructions for the proper disinfection procedure.

If we see better, and work with a comfortable working posture, we will work better and faster with less stress. Dentists, hygienists and technicians should consider a magnification system as an essential instrument to achieve highly detailed and long lasting results.

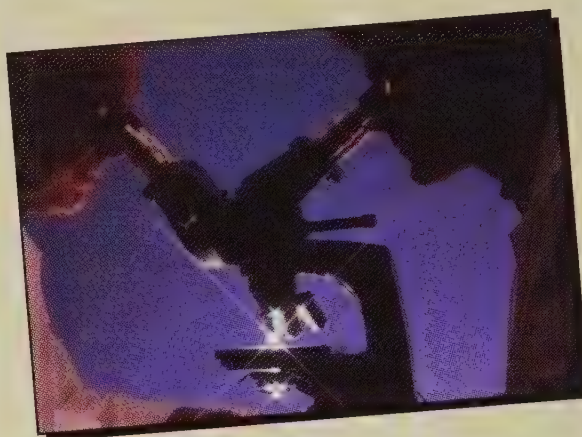
All the loupes described in this paper are good to excellent, and all have additional features and benefits. Regardless of which one you choose, it is usually preferable to start with relatively low magnification and begin with simple procedures during the initial adjustment period.

Ergonomic features, which will help to ensure a long-term, stress-free working posture, are just as important as optical features. Before choosing a magnification system, be sure to try many different brands and use this information as a basic guide to make an informed choice. ■

Dr. Kanca maintains a private practice in Middleburg, Connecticut, with a special interest in cosmetic dentistry.

Mr. Jordan is president of Clinical Research Dental in London, Ontario.

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Advanced Clinical Technology — Clinical Tool Or Expensive Toy?

Cary H. Ganz, DDS

ABSTRACT

There should no longer be any doubt in dentists' minds when it comes to the importance of technology in the day-to-day activities of the dental office. But there is, and this doubt must be addressed if the profession is to grow and prosper to its full potential. Denying the importance of technology — or putting on blinders — only leads to complacency, and clearly does not support our professions goal of providing the finest dental care possible. This article addresses the use of technology in a clinically-related manner, and attempts to provide the practitioner with valuable practice management tools to allow for a prosperous and efficient dental practice.

SOMMAIRE

Dans l'esprit de la profession dentaire, il ne devrait plus y avoir de doutes touchant l'importance de la technologie dans l'exercice quotidien de la dentisterie. Or des doutes persistent toujours et il convient de les dissiper pour que la profession puisse croître et prospérer. Nier l'importance de la technologie — ou porter des oeillères — mène seulement à la suffisance et s'éloigne de l'objectif de la profession qui est d'offrir les meilleurs soins dentaires possible. Dans cet article, on se penche sur l'utilisation de la technologie dans le contexte clinique et on essaie de fournir au praticien des outils pra-

tiques pour gérer son cabinet de façon à ce qu'il soit efficace et prospère

Introduction

Even in years past, it was difficult, if not impossible, for dentists to wear the hats of a marketing expert, an accountant, a practice management expert and a staff manager — in addition to practising the clinical aspects of dentistry. That hasn't changed. The difference is that today's dentists are faced with an ever increasing number of practice decisions, particularly when it comes to their participation in the emerging practice profit centres created by the introduction of advanced clinical technology (ACT) in dentistry.

ACT can be defined as the use of highly sophisticated computerized equipment in the clinical practise of dentistry. Much of this technology is not necessarily new, but has been gleaned from either medicine or other sources, such as industry or the military.

The decision to go with ACT should be based on the same criteria that dentists currently use to investigate the clinical usefulness of any and all new products. These criteria should take a number of considerations into account, including the professional and ethical issues of clinical efficacy (does the product do what the manufacturer says it does?), clinical practicality and efficiency, cost effec-

tiveness, slope of the learning curve, and most important of all, patient directed benefit.

Before any product becomes an integral part of a dental practice, it should not only fulfil these minimum criteria, but also have direct patient benefit. If a product does not improve our patients' oral health, or in some way impact on their dental well-being, it should be set aside until it has been improved or modified to meet these all-important criteria.

Each of the products mentioned in this article has been used clinically in my prosthodontic practice, and has enhanced not only my communication skills, but also my ability to provide the best clinical care.

This article is intended to introduce both new dentists and seasoned practitioners to a variety of new technologies. The examples used here are by no means the only products available today, but all of them have met the evaluation criteria I've outlined. It is up to individual practitioners to assess these technologies in their own way to ensure proper placement within their own practice environment.

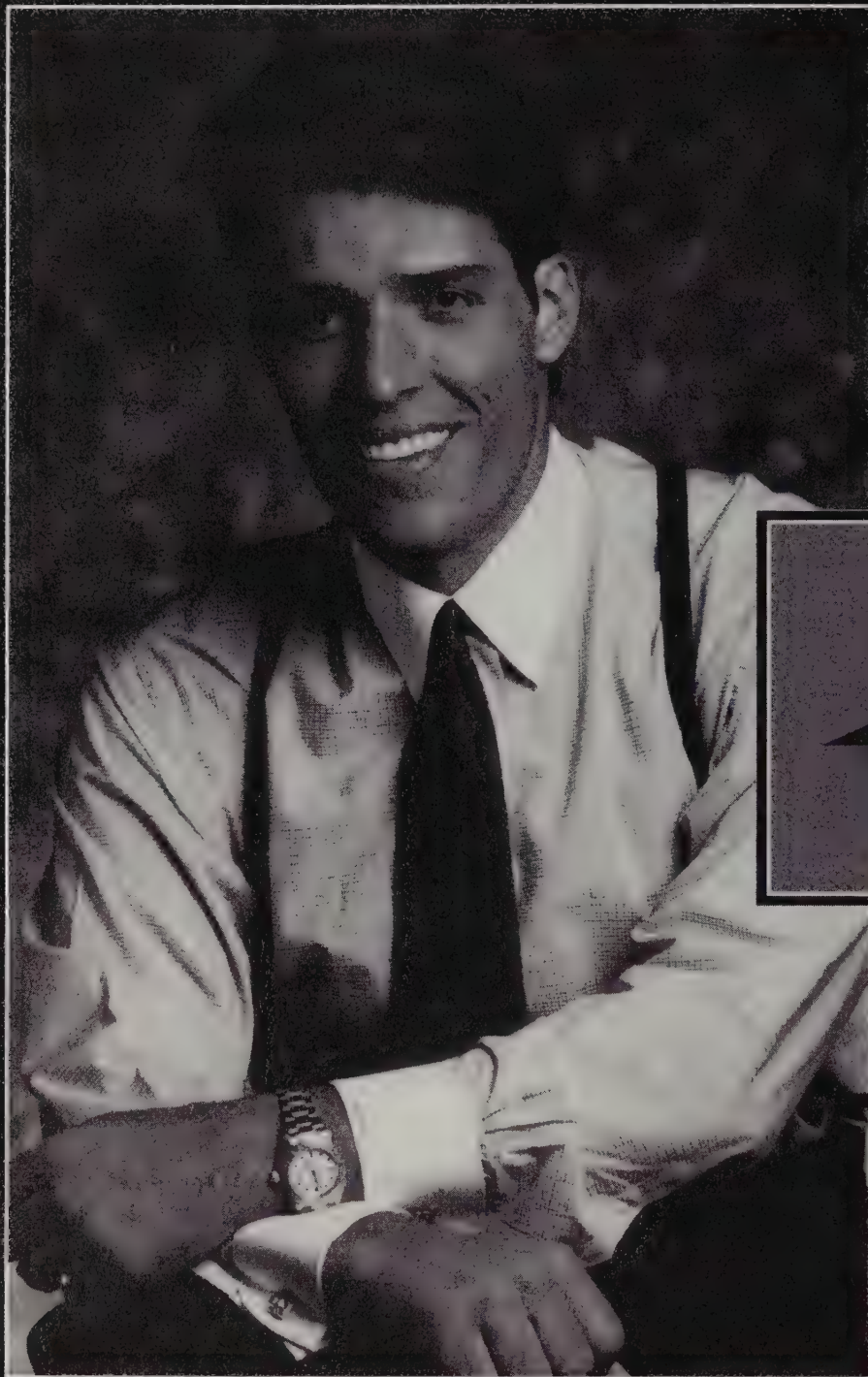
Dental Lasers

The introduction of dental lasers to dentistry began with the clinical availability of American Dental Lasers Neodymium-Aluminum-Garnet (Nd:YAG) laser. Today there are four basic types of lasers available to the dental profession.

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Find Your Fortune.



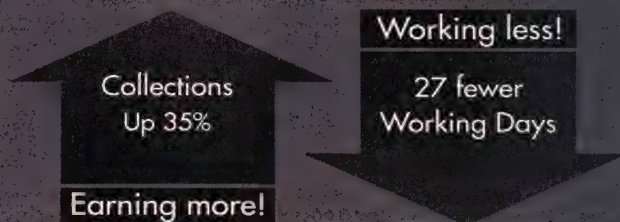
*A*re you enjoying the kind of practice and lifestyle you imagined when you began your journey into the dental profession? Maybe you've seen our "Faces of Fortune" ads highlighting the success others have achieved by working with Fortune Practice Management. But did you ever wonder if our coaching and strategies could work for you?

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Fig. 1: Carbon dioxide laser being used in the operatory as part of a crown and bridge procedure.

It is extremely important to understand that laser-tissue interaction is specifically related to the lasers wavelength. Each of the four laser types discussed in this article: Nd:YAG; CO₂; Holmium:YAG; and Argon, interact with gingival tissue in different ways, based on where their wavelength is positioned in the electromagnetic spectrum.

All laser energy, regardless of wavelength, is either absorbed by the tissue, reflected off of the tissue, scattered within the tissue, or transmitted directly through the tissue. It is the combination of these tissue factors that determines the effectiveness of the laser in treating conditions of the oral cavity.

To date, dental lasers have been approved by the U.S. Food and Drug Administration (FDA) for soft tissue procedures only. This, however, applies only to dentists practicing in the U.S. and does not impact on treatment choices in Canada.

Nd:YAG Laser

The Nd:YAG laser has a wavelength of 1.06 microns or 1,064 nanometres, which is in the near infra-red part of the electromagnetic spectrum. By the nature of its wavelength, it is attracted to dark colors such as black or brown. When Nd:YAG laser energy impacts on gingival tissue, it penetrates the tissue until its energy is absorbed by darkly pigmented cells. Since gingival tissues have minimal pigmentation and are generally light in color, Nd:YAG energy is relatively poorly absorbed. Instead, it is scattered within the tissue, causing a deep layer of necrosis — anywhere from 1.0 to 4.0 mm.



Fig. 2: A typical cart system consisting of a video monitor, light source and video printer.

Nd:YAG lasers are relatively good at controlling hemorrhage and are being investigated for other treatment modalities such as soft tissue curettage, root hypersensitivity and enamel etching.

Carbon Dioxide Laser

The carbon dioxide laser (**Fig. 1**) (Luxar Inc, Bothel, Wash.) has a wavelength of 10.6 microns or 10,600 nanometres. In contrast to the Nd:YAG laser, the CO₂ laser has a strong affinity for water. Since most of the gingival cell is composed of water, CO₂ energy is almost completely absorbed within the first 100 microns of tissue.

Because of its efficient cutting ability and the excellent postsurgical healing response of the tissues, the CO₂ laser is particularly well suited for periodontal gingival surgery. Although the CO₂ laser's hemostatic abilities are somewhat limited, given its shallow depth of penetration, hemostasis can be adequately achieved for most, if not all, periodontal procedures provided that the operator has a good understanding of its wavelength characteristics. CO₂ lasers are also effective for Stage II implant uncovering, and in troughing for crown and bridge.

Argon Laser

The argon laser is unique in that it actually uses two wavelengths. The first, at 515 nm (green in color), is



Fig. 3: Multi-operatory imaging systems require a portable light source and camera in order to maximize the efficient use of the technology within the multiple operatory dental office.

used for the surgical treatment of soft tissue. Argon, by nature of its wavelength, is attracted to the color red. It is therefore an excellent hemostatic laser, although less efficient in its cutting ability than the carbon dioxide laser.

The argon laser's second wavelength — 488 nm (blue in color) — is used to cure composites. It is this wavelength that appears to be directing the argon laser's use in dental practice. Argon lasers that can be used in the operatory in much the same manner as a dental handpiece (ILT Systems, Baltimore, Md.) are now available. According to its manufacturer, the argon laser cures composites in one-eighth of the time required by conventional methods, and to a significantly stronger level.

Holmium:YAG Laser

The holmium:YAG laser's wavelength is not absorbed by water. It is a good coagulator that is highly effective when used in areas such as the temporomandibular joint, and is particularly useful in the surgical treatment of TMJ.

Laser Safety

Before they bring lasers into their practice, dentists and their staff should participate in a training course that emphasizes both clinical effectiveness and safety.

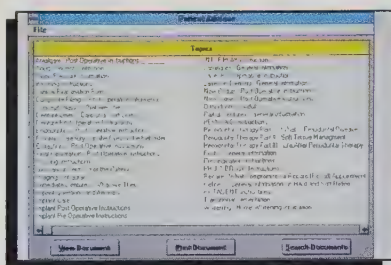


Fig. 4: A glossary of practice management info sheets supplied with the Patient Advisor.

Benefits of Lasers

When dentists measure the direct patient benefit of lasers relative to other dental devices, it is important to understand that lasers provide a direct surgical benefit to the patient in that they seal nerve endings and blood vessels during surgery, reduce swelling by closing off lymphatics, and have less scarring than traditional methods. Although healing times may be slightly longer following laser surgery, relative to the healing times observed with more conventional scalpel techniques, laser wounds are less painful during the healing process.

Intraoral Imaging

Nothing has taken dentistry by storm like the intraoral camera. According to *Dentistry Today*, 30 to 40 per cent of dentists have an intraoral camera in their practice. The advantages of this technology are well documented. It can also be used extraorally to demonstrate cosmetic alterations such as the closing of diastemas, or the whitening and straightening of a mutilated dentition. The ability to communicate with the patient on a visual level allows for greater understanding, a significantly higher degree of patient awareness and participation, and an improved percentage of treatment acceptance.

There are several ways in which intraoral imaging can be introduced into the dental practice. The most simple system comes right off the computer store shelf. Snappy (Play Inc., Rancho Cordova, Calif.) attaches directly to the parallel port (the printer port) on the computer. It comes with its own Windows-based software, which al-

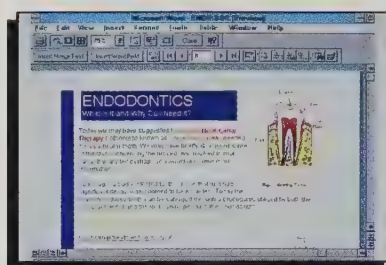


Fig. 5: A typical Patient Advisor info sheet shown in Word for Windows 6.0, which allows for the personalizing of the information for the individual practice.

lows for the capturing of images directly from any video camera through an S-Video cable. The extraoral images can then be saved and used for presentation purposes. Although Snappy cannot be used on its own for intraoral purposes, it can be attached to an existing intraoral camera and used, for instance, with a laptop computer. This type of system is useful only as an introduction into computerized imaging.

To proceed to the next, more clinically appropriate, level of intraoral imaging requires the purchase of an entire intraoral system, which is typically composed of an intraoral camera (either analog or digital), a storage device and a printer.

Many of these systems (AcuCam by New Image Industries, Insight from Insight Industries, Reveal from Insight Industries, VistaCam Escort from Air Techniques, Inc., and others) are assembled on a mobile cabinet (**Fig. 2**) (VistaCam-Air Techniques, Hicksville, N.Y.).

Depending on the system selected, images can be obtained in either an analog (like a video camera) or digital (computerized) format. Digital imaging allows the user to alter the captured image, in combination with computer software, and seems to be the wave of the future. The images can then be used in conjunction with an integrated computer management system, and used as a source of patient medical/legal documentation, as well as in internal and external marketing programs, interoffice specialty correspondence, and as a form of insurance submission validation. These options allow the dental practice to maximize its computer investment.

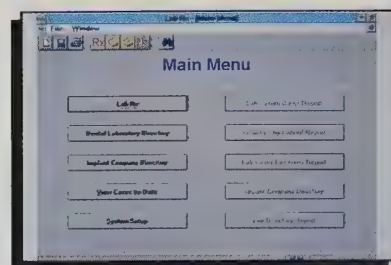


Fig. 6: The LabRx front-end screen permits the dental practice to enter laboratory information into their computer.

To permit dentists to take full advantage of the benefits of intraoral imaging, most companies have developed multiple operator systems (**Fig. 3**). In these systems, rather than having the computer equipment and camera on a mobile cabinet, the equipment is centrally located and only the camera is mobile. This multi-operator concept allows for much greater flexibility and clinical efficiency. New intraoral camera users should be aware that if a mobile system is initially purchased, it can be upgraded to a multi-operator system should the need or desire arise.

Patient Directed Correspondence

Another area of technological advancement involves using computers to coordinate patient information. As dental practices become more diverse and treat a wider variety of conditions, patient communication skills become increasingly important. Several products are currently available that assist the technologically-advanced dental practice in administering that task.

The Patient Advisor (**Fig. 4**) (Message Mate Inc., Rockville Centre, N.Y.) is a Windows-based program containing more than 50 treatment-directed letters that have been individually customized for both the dental office and the patient. Using the system, most of the clinical procedures provided in a general practice can be discussed and presented to the patient in a graphical, patient-oriented treatment letter (**Fig. 5**). These treatment letters — as well as about 40 additional practice management letters — can be used as medi-

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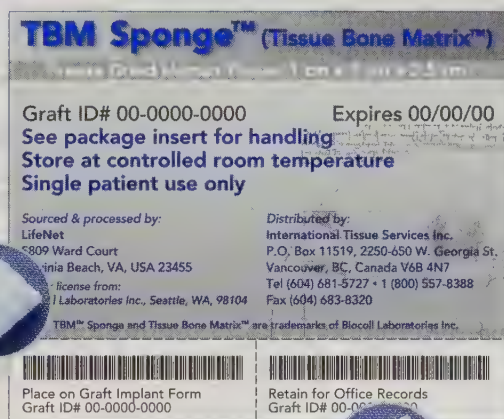
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1. Urist, M.: Bone formation by autoinduction. Science. 150:893; 1965. Sampath, T.K., Nathanson, M.A. and Reddi, A.H.: In vitro transformation of mesenchymal cells derived from embryonic muscle into cartilage in response to extracellular matrix components of bone. Proc. Nat. Acad. Sci. 81:3419-3423; 1984.

*Refund excludes shipping, handling and insurance.

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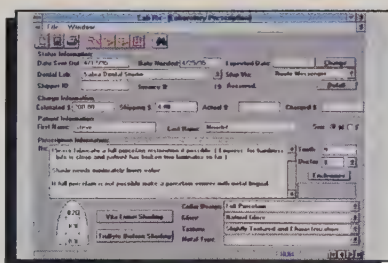


Fig. 7: The computer can then print as many prescriptions as necessary.

cal/legal documentation, statement stuffers, internal or external marketing pieces, and very often can replace the need for office brochures.

The Clinical Office, a group of fully-integrated computer utilities including the Patient Advisor, the Hygiene Hotline, the LabRx, the Referral Tracker, the Prescription Writer and the Implant Advisor, is designed to assist dentists in maximizing their computer expense by creating a more efficient and practical office environment. The LabRx (Fig. 6) permits the dental office to create its lab prescriptions on the computer (Fig. 7), print as many copies as needed (Fig. 8), and most important of all, store the information in a retrievable database format. When needed, reports indicating return dates and actual received dates can be printed and used to assist the front office staff in filling empty treatment slots in the daily schedule. Monthly reports detailing lab cost by patient, by lab or by a specific period of time can be used to double check lab invoices, control overhead and, for the first time, accurately cost-account treatment procedures.

Intraoral Filmless Radiology

Intraoral Filmless Radiology (IFR) is rapidly emerging as an important clinical modality. This technology replaces the standard dental film with a unique sensor. When the sensor is impacted by radiation, a computerized image appears almost instantly on the dentist's computer screen. In addition, the amount of radiation needed to create this image is re-

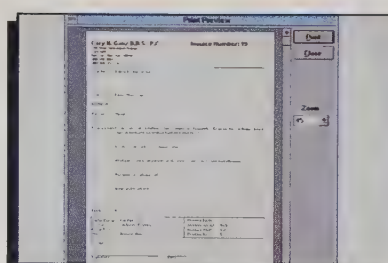


Fig. 8: The LabRx allows for the total management of the dental office laboratory with a variety of reports aimed at maximizing chairtime and scheduling efficiency.

ported to be anywhere from 70 to 90 per cent less than it is for standard dental film. The other advantages of IFR are:

1. Rapid development. Instead of minutes lost waiting for a radiograph, IFR offers practically instantaneous development of the image.
2. Instead of searching through charts for that single X-ray in the typical yellow manila envelope, it is now possible to review X-rays through a computer database.
3. Radiographs can be printed on a laser printer (preferably at 600 dots per inch) and multiple copies can be made as needed.
4. Significantly lower dosage of radiation to patient. The amount of radiation reduction depends on the speed of film currently in use.
5. IFR can be integrated into a number of computerized management systems to create a complete clinical patient record (Fig. 9 and 10) (ComputerAge Dentist, Santa Monica, Calif.). If the dental office's computer system is networked, computerized records can be made available throughout the practice — in the operator, at the front desk, and in the private office. Radiographs and intraoral images can then be used as part of a total case presentation (Fig. 11 and 12), or, whenever necessary, sent through the telephone lines to facilitate an interspecialty teleconference.

There are several companies in this exciting new arena — Shick Technologies, Inc., Trophy, Re-

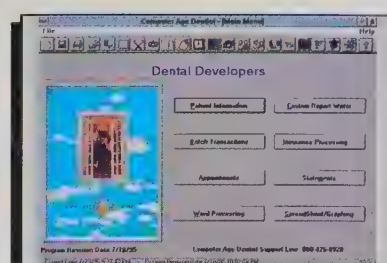


Fig. 9: The main menu for the Windows version of ComputerAge Dentist.

gam, and Digora by Soridex. Although each product is slightly different in its technology, all of them share a common thread — less radiation and increased clinical efficiency. It is only a matter of time before this technology is patient driven into the clinical practice of dentistry.

And The List Goes On And On ...

There are many other tools available to the new and skilled computer user that can be of tremendous value either as part of a combined, creative and well conceived practice management system, or as stand alone products. Two of these modern wonders are Smart Label Pro SII by Seiko and the PaperPort by Visioneer. Both fit well within the budget of any dental practice. In fact, it seems that sometimes the smaller the gadget, the bigger the payback.

Let me explain.

There are many times within the practice day when one, two or several labels are needed. Seems like a small problem, but just speak with any front desk person and they will tell you how frustrating this task can be.

Say that the new patient chart, a lab case, or perhaps a generalized mailing to patients needs to be done quickly. To create computer-generated labels, most programs require either a dot matrix printer (traditional computer paper with the holes on the side), or a complex software program capable of using a laser printer. To produce a single label with a laserjet printer wastes the remainder of the labels on the page, and trying to print

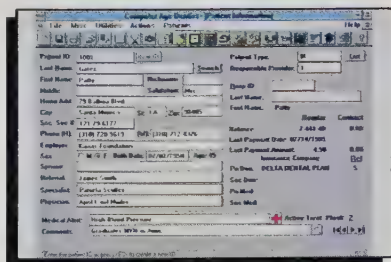


Fig. 10: The graphically-oriented patient information screen provides the forum for all of the necessary patient data.



Fig. 13: The Smart Label Pro SII can function in either the Windows or DOS environment.

one label with a dot matrix printer necessitates loading labels, which by itself can be a full days work. The Smart Label Pro SII by Seiko (**Fig. 13** and **14**) (available at all computer stores) allows users to print either one or several labels at a time, from within Windows or DOS. It installs in minutes and requires no additional computer boards or hardware. You simply attach it to an available serial port on the back of your computer and load the included software. You can be up and running in a matter of minutes. By combining this label printer with an intraoral camera such as the QuickTake 100 by Apple (available for Windows and Macintosh), ambitious practices can even place the patient's picture on his or her chart label. These labels can then be sent to referring doctors, along with an introductory letter, as a means of patient introduction. Imagine what it

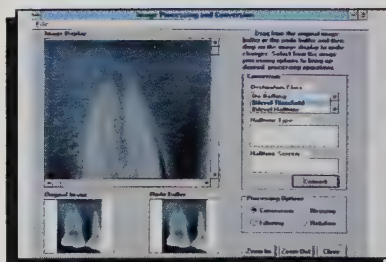


Fig. 11: The Windows-based program permits the integration of patient information with digitized X-rays and intraoral images.

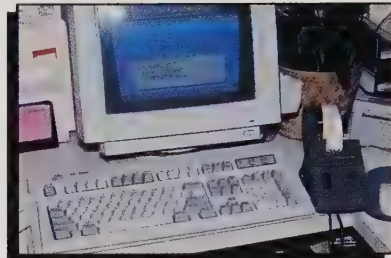


Fig. 14: The Smart Label Pro SII connected to the computer via a serial port.

feels like to enter an office as a new patient and be greeted warmly, by name, because someone recognized you from a computer generated label.

The PaperPort by Visioneer is a new and unique concept in document storage and retrieval. Perhaps the day of the paperless office is finally here. Like the SmartLabel Pro, the PaperPort (**Fig. 15**) simply attaches to a serial port. It consists of a small scanner (an instrument that scans paper into the computer and turns it into computer image) and some computer software. So what's the big deal? Well, how about getting rid of all of those crumpled pieces of paper in your dental chart. Even if you don't have a practice management system, you can use PaperPort to organize all of those pieces of correspondence — old, wrinkled insurance forms and little Post-It notes lying around on your desk. All you have to do is place the paper in the scanner. It turns on by itself and scans the document into the PaperPort software program. Once the information is scanned in, you can file the document into a customized folder labelled in any way you choose. For example, an insurance form comes in for Mrs. Smith. Instead of placing it in

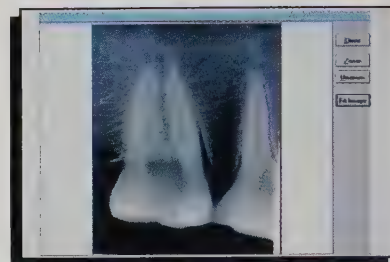


Fig. 12: Same as Fig. 11.

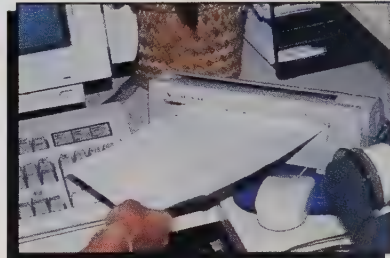


Fig. 15: The PaperPort connected to the computer.

the patients chart, you scan it into Mrs. Smith's folder in PaperPort. You can then throw away the insurance form. If you ever need to review that form, just open it up in PaperPort and, if necessary, print it out on your printer. No more paper to clutter up your office or for your staff to misplace. Seems almost too good to be true — simple, inexpensive and very impressive. PaperPort can be used as a storage device for your patients records, your personal documents such as receipts and paid invoices, and even as a means of storing visual images. You can scan in pictures and store them in a similar fashion. PaperPort is the first step toward the life-long dream of every dentist and dental office manager for the truly paperless office.

Conclusion

Each of these technologies can be broken down according to their advantages and disadvantages. The disadvantages can be grouped according to capital expense and/or educational requirements. Each technology requires an initial outlay of both time and money, as well some effort on the part of dentists and their staff in learning how to use the technology properly.

However, when weighed against the overwhelming number of clinical and management advantages, it becomes clear that participating in ACT is rapidly becoming a requirement for the modern dental practice. The question should not be whether to participate, but rather when to initiate that participation. In any case, technologies such as those discussed here are no longer considered new toys or gimmicks. They are recognized as clinically appropriate tools that not only enhance our ability to communicate, but also stimulate our ability to provide a finer system of oral health care. ■

Dr. Cary Ganz is a practising prosthodontist in Rockville Centre, N.Y. He is also program director of the Implant Fellowship Program, and chief, Advanced Prosthodontic Division, North Shore University Hospital.

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Snakes. Twigs. Hair. Nylon. Motors. What's next?

The North American Indians believed that running a green snake across their teeth seven times would keep them sound for life.

Oil of ant, dried vipers and the brains of a hare have also been used throughout history to promote cleaner, healthier teeth. Of course, none of them worked. They didn't taste like much, either.

The first real advancement in oral hygiene was over 2,000 years ago. An Arab pulled a twig off the *Salvadora persica* tree, rubbed it against his teeth, and the toothbrush was born.

The toothbrush as we know it today wasn't invented until almost

1,500 years later. It took another 500 years before the hair brush was replaced by the nylon brush we



use
today.

And the electric toothbrush, the last real advancement in oral hygiene, has been around for over 100 years.



So what's
next? The SenSonic™
Plaque Removal Instrument.
From Teledyne Water Pik.

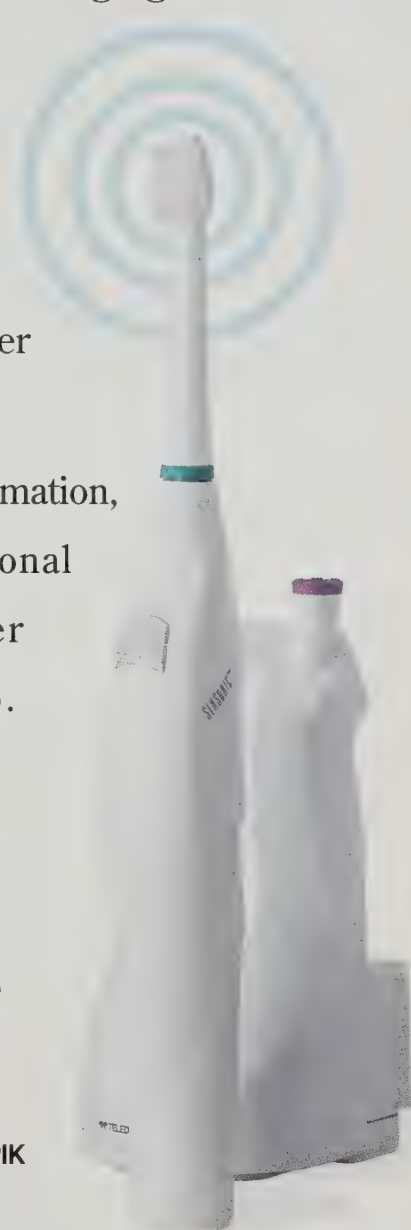
Sonic technology is the
first breakthrough in oral hygiene
since the electric toothbrush. The
SenSonic delivers 30,000 brush strokes
a minute. That's five times faster than
electric brushes, and 100 times faster
than manual brushing. So it effectively
removes plaque and reduces stains.

At sonic speed, the SenSonic
stimulates toothpaste into a penetrating
foam that cleans hard to reach places.

And with a lateral motion of $\pm 10^\circ$,
plus a compact brush head and contoured
bristles, it's gentle on gingival tissue
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— **Montréal 1996** —

The Convention with a *Difference*



Those of you who attended the CDA 1995 Convention this past August, I'm sure will join me in reiterating that it was a very positive experience for the dental professionals of Canada! We are pleased to announce that more than 1,900 dentists were in attendance with a total number of 5,159 participants. In addition, our demographic statistics

show that participants travelled from all across Canada to attend — each province was represented at the meeting. Special thanks to Dr. Elizabeth MacSween, the Organizing Committee and Convention staff for a job well done.

The scientific program with lectures covering a wide range of topics in dentistry were well received. The lecture rooms were full and the hands-on courses sold-out. Many participants have indicated that the new exhibit hall design was a hit and the exhibitors are beginning to plan their participation for the CDA 1996 Montréal Convention now.

The 1996 Convention will take place at Place Bonaventure Exhibit Hall and in the Montréal Bonaventure Hilton, the headquarter hotel. We have also secured accommodations in several of the surrounding hotels. A 1996 preliminary program complete with enrolment form and hotel accommodation will be sent to every dental office in Canada early in the new year.

We are very enthusiastic about the 1996 Convention. Montréal is a great city with a lot to offer as a holiday destination. From the excitement of the Casino to the relaxing ambiance of outdoor cafés, from the new and

fusion cuisines of multi-ethnic restaurants to the frenzy of contemporary nightclubs, Montréal is a place that never sleeps. It offers a host of events and outings and we will schedule several of these for your enjoyment in our 1996 program. As our planning develops, we will keep you updated on the various aspects of the Convention as we formulate new ideas and introduce new frontiers.

We have labelled CDA '96 as the 'Convention with a difference', the only meeting bringing dentists together from across the nation. Given the number of dentists who attended the Ottawa Convention, the number of CDA members in Québec and the attraction of the city, we are expecting a record number of attendees. It will be a Convention you will not want to miss. We hope that you will plan now to join us in the summer of 1996. Highlight the dates of August 17 - 20 in your 1996 calendar.

We look forward to another great meeting for 1996.

Michel Jahjah, D.D.S.
General Chairman
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FDI 1996 is in Orlando



In 1996, the American Dental Association will host the 84th FDI World Dental Congress from September 28 - October 2. The location is Orlando, Florida, one of the most loved family travel destinations! Flights, accommodation and FDI 1996 enrolment forms can be obtained by contacting CDA Conventions.

Pre-Congress Tour

Western Caribbean Cruise (Sept. 22 - 29)

Temperature: moderate to warm. **Destination highlights:** *Grand Cayman* — see many rare and exotic birds, gaze at reefs of coral and do some snorkelling, shop for handmade crafts in the island boutiques. *Playa del Carmen / Cozumel* — an underwater adventure exploring the Palancar Reef — the second largest in the world; experience the ancient world of Cozumel's Mayan culture and the ruins of Tulum. *New Orleans* — enjoy New Orleans cuisine and southern architecture; in the French Quarter, browse antique stores, savour creole cuisine and experience the colourful street life as jazz musicians entertain you on Bourbon Street.

Post-Congress Tours

Walt Disney World (Oct. 3 - 7)

This tour will be a delight for all ages! Enjoy unlimited use of Disney World facilities — frontierland, tomorrowland, fantasyland, adventureland, Epcot centre, MGM studios and the Magic Kingdom.

Galapagos Islands (Oct. 3 - 10)

Temperature: moderate to warm. **Location:** 600 miles off the coast of Ecuador. **Tour highlights:** Visit *Lobos Islands* or *Ochoa Beach* where you will enjoy the company of sea lions along the sandy shore. While cruising the islands, take numerous naturalist *guided shore excursions* to explore the unique flora and fauna of the Galapagos. The reptile, bird and marine life of the islands are extremely rich with 500 pound tortoises and colourful prehistoric iguanas. Penguins, frigate birds, flightless cormorant, the Galapagos albatross, and blue footed boobies are part of a wealth of truly rare flora. The animals are fearless of man and can be closely approached. You may even walk, swim and snorkel with them.

Other 1996 Out-of-Country Seminars

Borneo — February 8 - 22

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South Africa — May 3 - 16

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For more information on
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October Spotlight on ...

Costa Rica

(Oct. 3 - 12)

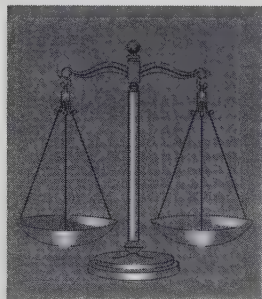
Climate: tropical. **Location:** Central America.

Tour highlights: *Poas Volcano National Park* — visit one of the deepest active volcanoes in the world. See a second crater with a rainfed lake and surrounded by a highland rainforest. A habitat for 80 species of birds, several are unique to this area. *Monteverde Cloud Forest Reserve* — extending

down both slopes of the Tiralan Mountains (elevation 2,300 to 5,600 feet), it encompasses eight different ecological life zones and protects over 100 species of mammals, 400 species of birds and 1,500 species of plants. *Monteverde Butterfly Garden* — a delightful half-day visit. *Arenal Volcano* — active since 1986, this volcano may display volcanic activity including explosions and lava flows. *Cano Negro National Wildlife Refuge* — provides shelter for jaguars, kingfishers, roseate spoonbills, lizards and much, much more. *Tortuguero National Park* — 21,000 hectares of tropical rain forest. Take a boat trip into the jungle for wildlife observation with a local guide. *Reventazon River* — Drive through sugar cane, coffee and macadamia nut farms en route for an optional day of white water rafting.



LAW AND ETHICS



The Law and Ethics In Dentistry: A Recent Human Rights Tribunal Judgment With Further Guidelines Concerning Dental Treatment Of HIV-Positive Patients

Peter E. Graham, BA, BCL, QC

Mili Harel-Raviv, DMD, Dip. Oral Med.

Introduction

In considering ethical issues related to AIDS and the functional management of HIV-seropositive patients, the dental profession must take into account the human rights legislation defining the rights of the patients. It should also understand how its positions and/or ethical statements on the provision of dental treatment to HIV-positive patients will be viewed by both the public and oral health care providers. Moreover, it must do so within the concrete framework of how a dental office should function.

The authors have previously reported on two recent Canadian judgments involving the application of human rights legislation as it applies to dentistry and HIV-seropositive patients.¹ This paper reports on a new related judgment. Dentists should be aware and informed about all judgments that involve or concern the dental profession. These types of reports may assist oral health care providers in establishing appropriate dentist-patient relationships and patient management approaches.

In the context of Canadian human rights law, the new Quebec judgment outlined in this paper

should serve as a detailed guideline to help dentists decide when and how to refer an HIV-positive patient. This could involve referral of the patient to a specialized centre for a second opinion; to be treated by a specialist; or to obtain special procedures and an analysis of his or her oral health status prior to the preparation of an oral health treatment plan. This approach would typically be used when the patient's oral health needs cannot be met in a private clinic, or they are too complex for the general practitioner.

Judgment Report

The case of La Commission des droits de la personne du Québec, Dr. G.G. and Mr. P.M., and the Order of Dentists of Quebec² was heard by the Quebec Human Rights Tribunal. The April 11, 1995, judgment rendered by the Honorable Justice Michèle Rivet, assisted by Me Edward Bridge and Me Diane Demers, closely followed two earlier human rights cases — *Jerôme v. De Marco* (Ontario Human Rights Commission)³ and *Hamel v. Malaxos*⁴ (Quebec Small Claims Court) — in concluding that Dr. G.G. was guilty of illegal discrimination when he refused to treat Mr. P.M., a patient

who had disclosed on his medical history form that he was HIV seropositive. The tribunal based its 69-page decision on Quebec's human rights legislation, Charter of Human Rights and Freedoms.⁵

As described by the Quebec Human Rights Tribunal, the facts of the case are as follows:

In October 1991, Mr. P.M. arranged for his first appointment with Dr. G.G., a Quebec dentist. When he arrived at the dental office, he filled out a medical history questionnaire. In so doing, he disclosed that he was HIV seropositive. The receptionist gave the form to the dental hygienist who withdrew into the office. She subsequently came back to advise Mr. P.M. that his appointment was cancelled because Dr. G.G. did not accept HIV-seropositive patients.

It is interesting to note that Dr. G.G. ultimately established that this no-treatment policy had been decided on following a meeting between himself and his staff — two dental hygienists, a dental assistant, and a receptionist. In his testimony before the Human Rights Tribunal, Dr. G.G. testified that although he was not fearful of treating HIV-positive patients himself, he understood why his hygienists were reluctant to do so,

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and he therefore concluded that it was better to refer such patients to high-risk treatment centres.

Analysis

In this case, Dr. G.G. contended that an HIV-seropositive patient is not a disabled patient in the sense of Canadian human rights legislation — particularly with regard to Quebec human rights legislation. He contended that unless there is some apparent effect indicating the disability, then it is not a disability or at least not a disability within the terms of the Act.

The Charter of Human Rights and Freedoms, while stipulating in section 10 that no one shall discriminate against a handicapped person so as to nullify or impair any of his rights, does not define the term handicap. Another Quebec human rights statute — An Act to Secure the Handicapped in the Exercise of their Rights⁶ — in section 1(g), defines handicapped person as follows:

" 'Handicapped person,' or 'the handicapped' in the plural, means a person limited in the performance of normal activities who is suffering, significantly and permanently, from a physical or mental deficiency, or who regularly uses a prosthesis or an orthopedic device or any other means of palliating his handicap."

Such a definition does not seem to include a person who is HIV seropositive.

In Canada, it is not unusual for Canadian tribunals to refer to decisions from foreign countries, or cite pronouncements by international organizations, in reaching their own judgments on human rights matters. This was certainly true in this particular judgment, where the tribunal was particularly concerned with American Supreme Court cases bearing on the issue of whether being HIV seropositive constitutes a handicap within the legal definition of that term.

In addition, the tribunal reviewed the concept of handicap and discrimination on an international basis, by referring to several international documents such as those of the World Health Organization (WHO), which, in 1983, arranged a meeting of experts on the

question of AIDS. The tribunal also referred to various United Nations (UN) pronouncements, including a 1987 resolution directing WHO to coordinate the fight against AIDS in order to reduce the social and personal impact of this disease and unite the efforts of various nations in this regard. Numerous documents regarding these international efforts refer to the need to respect human rights and avoid all discrimination. These documents point out that if HIV-positive persons are excluded from society, they are likely to become totally irresponsible, rejecting all attempts at treatment or any form of control designed to deal with the problems arising from this infection, and to react aggressively against the society that excludes them. In doing so, they would pose a greater threat to society and to themselves than would otherwise be the case.

Justice Rivet's judgment states that the: "Protection of the non-infected public requires a non-discriminatory approach."

It also cites "Legislative Responses to Aids," a document released by WHO in 1989, which states that: "Protecting the human rights and dignity of HIV-infected people including people with AIDS and members of population groups is not a luxury — it is a necessity. It is not a question of 'the rights of the many' against 'the rights of the few'; the protection of the uninfected majority depends upon and is intrinsically bound with the protection of the rights and dignity of the infected persons."

The tribunal also cited numerous American statutes on the subject, one of the most interesting being Chapter 706 of the Rehabilitation Act of 1973,⁷ which defines a handicapped person as:

"Any person who (i) has a physical or mental impairment which substantially limits one or more of such person's major life activities; (ii) has a record of such impairment; or (iii) is regarded as having such an impairment."

The Supreme Court of the United States case of *School Board of Nassau County v. Arline* was also cited, as follows:

"This subsection includes ... those persons who do not in fact have the condition which they are perceived as having, as well as those persons whose mental or physical condition does not substantially limit their life activities and who thus are not technically within clause (a) in the new definition. Members of both these groups may be subjected to discrimination on the basis of their being handicapped."⁸

The Quebec tribunal used these definitions from foreign and international law to indicate how far the definition of handicapped is generally considered to extend, i.e. how broadly the concept may be interpreted. The tribunal then applied this very broad, sweeping interpretation to the Quebec human rights legislation.

The judgment also cites the following extract from the Supreme Court of the United States judgment in the Arline case:

"The Supreme Court recognized in Arline that a significant risk of transmission was a legitimate concern which could justify exclusion if the risk could not be eliminated through reasonable accommodation; however, it soundly rejected the argument that the exclusion could be justified on the basis of pernicious mythologies or irrational fear." (*Chalk v. U.S. District Court, Central District of California*, page 711.)

This, of course, relates to fear of significant risks of transmission of the disease from the patient to the health practitioner.

The judgment of the tribunal also refers to another section of the American Rehabilitation Act on the definition of disability, which specifically states that in this Act, the phrase "physical or mental impairment" includes "HIV disease (whether symptomatic or asymptomatic)."

The tribunal went on to show that American courts have considered the question of whether an individual poses a direct threat to the health or safety of others. The term direct threat means "a significant risk to the health or safety of others that cannot be eliminated by a modification of policies, practices or procedures, or by the provision



of auxiliary aids or services." (Article 1218 2(b) (3) of the Rehabilitation Act).⁷

The regulations that fall under the Rehabilitation Act⁷ are particularly interesting in that they have referred to sending the patient to another source for treatment. However, the regulations also stipulate that this should only be done if it would occur in the normal course of the health-care centre's operations, and if a similar referral would be made for a person without a disability:

"(1) A public accommodation may refer an individual with a disability to another public accommodation, if that individual is seeking or requires treatment or services outside of the referring public accommodation's area of specialization, and if in the normal course of its operations, the referring public accommodation would make a similar referral for an individual without a disability who seeks and requires the same treatment or services.

"(2) A health care provider may refer an individual with a disability to another provider, if that individual is seeking or requires treatment or services outside of the referring provider's area of specialization, and if the referring provider would make a similar referral for an individual without a disability who seeks and requires the same treatment or services ..."¹⁰

The tribunal went on to cite further extracts from American legislation to the effect that there is an exception to the discrimination provisions of the law in the situation where the individual concerned creates a direct threat or significant risk to the health and safety of others, but only if this direct threat means a significant risk to the health or safety of others, which risk cannot be eliminated by a modification of policies, practices or procedures or by the provision of auxiliary aids or services.

The tribunal also pointed out that most of the American statutes have adopted the definition of handicap or disability found in the Rehabilitation Act.

In relation to American legislation, the tribunal cited the Minnesota Court of Appeal judgment in *State by Beaulieu v. Clausen*,¹¹

which involved a dentist who was charged under the Minnesota Human Rights Act for having discriminated against a patient by refusing to render him services because he was HIV positive.

The tribunal also referred to two American cases where medical services were refused to homosexuals who were believed to be HIV positive or who might have been HIV positive. This also was held to be illegal discrimination.

Finally, the tribunal reviewed Canadian cases and legislation on civil rights issues and, in particular, the cases of *Hamel v. Malaxos*⁴ and *Jerôme v. De Marco*.³ In both of these cases, it was held that an HIV-seropositive person is suffering from a disability within the terms of Ontario and/or Quebec human rights legislation.

It should be pointed out that Canadian human rights legislation is less categorical or specific than United States legislation, in that some American statutes have specifically stated (as mentioned above) that a person who is HIV seropositive is defined as disabled within the eyes of the law, and is therefore protected by human rights legislation.

The Decision

The judgment found Dr. G.G. guilty of illegal discrimination and ordered him to pay a fine, plus interest and court costs. He was also ordered to cease systematically refusing to treat HIV-seropositive patients at his clinic — i.e. to accept anyone who is HIV positive or ill with AIDS just as he would any other patient — with the possibility of referring these patients to a hospital clinic if they could not be appropriately treated in a private clinic, or if their case was so complex that he was unable to treat it.

Principles Of Human Rights and Discrimination

Readers should be aware of the following principles of human rights law which, although not all specifically set out in the cases we have discussed, form the legal background of discrimination and human rights principles.

Intent to discriminate is not a necessary element in discrimination cases. It is only the resulting discriminatory effect that is important, and whether it comes within the legally specified categories of what constitutes illegal discrimination (such as refusing services to someone because he or she is handicapped). Under the law of Quebec, it is illegal to discriminate against anyone on the basis of gender, children, color, social security, race, language, handicap, age, pregnancy, ethnic or national origin, sexual orientation or religion. Each province has fairly similar human rights legislation.

Once discrimination is established, it is usually impossible to justify the act on the grounds that it was done in the interests of the public good — i.e. necessary for the protection of the health or essential welfare of the general public (*Regina v. Oaks*)¹². See also *Druken et al v. Canada*,¹³ which states:

"Where a service otherwise available to the general public is being denied, the justification for such denial must be based on the strongest possible evidence. The justification must be a question of fact in each situation and not merely a blanket application to a particular group of individuals."

In *Regina v. Oaks*, (Supra)¹², at page 139, the Supreme Court of Canada discussed weighing the importance of different interests of society in arriving at those very rare instances where individuals' rights can be overridden in the interests of society in general:

"... in each case, courts will be required to balance the interests of society with those of individuals and groups. There are, in my view, three important components of a proportionality test.

"First, the measures adopted must be carefully designed to achieve the objective in question. They must not be arbitrary, unfair or based on irrational considerations. In short, they must be rationally connected to the objective.

"Second, the means, even if rationally connected to the objective in this first sense, should impair as little as possible the right or freedom in question ...



"Third, there must be a proportionality between the effects of the measures which are responsible for limiting the Charter right or freedom, and the objective which has been identified as of *sufficient importance*."

Therefore, the decision to adopt a policy of not exposing anyone working in a dentist's office to the risk of being exposed to any patient known to be HIV seropositive would not satisfy the Canadian courts or tribunals (whether federal or provincial) as a defence to proceedings based on discrimination.

Suggestions

Oral lesions may represent some of the earliest signs of infection with HIV and may be of prognostic significance in the subsequent development of AIDS. Left untreated, these lesions may produce significant morbidity (Greenpan 1993).¹⁴ Early and correct diagnosis is important for improving the quality life of HIV-positive patients (as with all patients).

Does every general dental practitioner recognize the whole classification of the oral lesions related to the HIV virus? If the answer to this question is in doubt, maybe a referral to a specialized high-risk centre is preferred — not only for the dentists' benefit, but also for the HIV patient to receive the appropriate management and treatment. The criteria for determining when a case is too complex for a general practitioner to treat still require further consideration, even though, generally speaking, the general practitioner should be able to provide all those treatments that general practitioners as a group do not refer to specialists.

Ideally, a comprehensive exam should be prepared. Each patient should then be accepted simply as a member of the general population and a general oral exam should be done. Finally, a dental treatment plan should be made and presented to the patient.

In cases where a special oral lesion or dysfunction is found in the general management phase or in preparing the plan, then referral for consultation to a specialist or hospital, as would be done with

any other patient, is appropriate. That is to say, referral should only occur in specific cases that cannot be treated because of lack of expertise or lack of facilities, or when a second opinion is required. This possibility should be presented to the patient and discussed to give him or her the option of accepting or refusing the referral. Refer only when the patient agrees to be referred.

There is a need for more surveys to elicit data from all groups involved in dentist-patient relationships, especially patients in high-risk groups, i.e. those who are HIV-seropositive. Oral health care providers, the general population (the potential dental patients), and HIV-seropositive patients should be questioned as to whether they would accept referral to a specialized centre, or whether, in their minds, such a referral should be considered to be an act of discrimination against the patient. ■

Peter E. Graham is an assistant professor of preventive and community dentistry, faculty of dentistry, McGill University, and a partner in McDougall, Caron, a Montreal law firm.

Dr. Mili Harel-Raviv is head of the department of preventive and community dentistry, faculty of dentistry, McGill University.

Reprint requests to: Dr. Mili Harel-Raviv, Head, Preventive and Community Dentistry, faculty of dentistry, McGill University, 740 Dr. Penfield Ave., Montreal, Quebec H3A 1A4.

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- Druken et al v. Canada*, 8 C.H.R.R., Vol. 8, Decision 690, paragraphs 34302-34352, especially paragraph 34342, 1987.
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Whereas every human being possesses intrinsic rights and freedoms designed to ensure his protection and development;

Whereas all human beings are equal in worth and dignity, and are entitled to equal protection of the law;

Whereas respect for the dignity of the human being and recognition of his rights and freedoms constitute the foundation of justice and peace;

Whereas the rights and freedoms of the human person are inseparable from the rights and freedoms of others and from the common well-being;

Whereas it is expedient to solemnly declare the fundamental human rights and freedoms in a Charter, so that they may be guaranteed by the collective will and better protected against any violation;

Therefore, Her Majesty, with the advice and consent of the National Assembly of Quebec, enacts as follows:

(10.) Every person has a right to full and equal recognition and exercise of his human rights and freedoms, without distinction, exclusion or preference based on race, colour, sex, pregnancy, sexual orientation, civil status, age except as provided by law, religion, political convictions, language, ethnic or national origin, social condition, a handicap or the use of any means to palliate a handicap.

Discrimination exists where such a distinction, exclusion or preference has the effect of nullifying or impairing such right.

(12.) No one may, through discrimination, refuse to make a juridical act concerning goods or services ordinarily offered to the public.

(49.) Any unlawful interference with any right or freedom recognized by this Charter entitles the victim to obtain the cessation of such interference and compensation for the moral or material prejudice resulting there from.

In case of unlawful and intentional interference, the tribunal may, in addition, condemn the person guilty of it to exemplary damages.



Dentistry Canada Fund
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Dentistry Canada Fund Launches National Appeal

On June 30, 1995, the Dentistry Canada Fund completed its first full year of operation as Canada's only national, charitable non-profit organization dedicated to optimal oral health for all Canadians. During the January 1, 1994 to June 30, 1995 period, well over \$380,000 was donated by individuals, businesses and associations which, combined with our investment income, has allowed us to support a wide variety of projects and programs directly related to our mandate.

A total of \$46,000 was awarded to students pursuing postgraduate degrees in dentistry programs; \$14,000 was made available to undergraduate students with special financial needs; up to \$3,500 per faculty was provided to Canada's dental schools for student awards and program enhancements; over \$15,000 was awarded to teachers of Canadian Dental Assisting, Dental Hygiene, University and Community/Special interest projects due to the ongoing support of Warner-Lambert Canada Inc.; <CREST> Procter & Gamble provided much needed funding for Research Awards and the Task Force on Dental Education; Wrigley Canada Inc. provided the resources necessary for over \$20,000 to be awarded to Canadian dental students for research projects; almost \$20,000 was provided by Dentsply Canada Inc. to enable the annual Student Clinician Program to take place (1995 is its 25th Anniversary). Over 1,200 individuals have do-

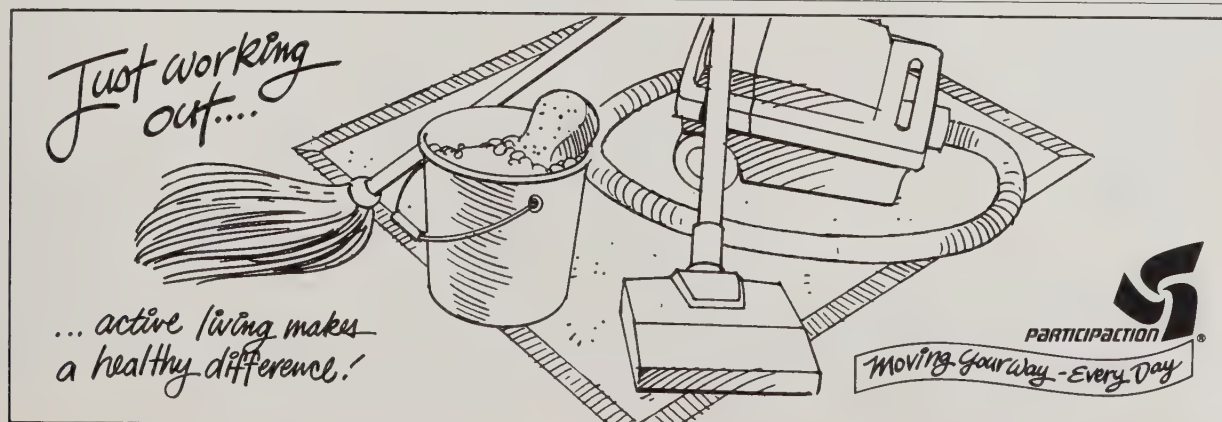
nated to a host of other DCF activities in 1994/1995.

But much more needs to be done. Well over 50 per cent of all applications made to DCF have to be turned down — the resources do not approximate the need.

During October every dentist in Canada will receive a letter from DCF Chairman, Dr. Gordon Thompson, inviting everyone to join the ranks of the many hundreds of others who have supported DCF and have realized what an excellent investment it is for the future of dentistry in Canada. A detailed listing of donation options will be found in this letter. All contributions will be receipted for a tax credit.

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An Innovative Method Of Cushioning Metal Clamp Jaws During Rubber Dam Isolation

William H. Liebenberg, B.Sc., BDS (Rand)

ABSTRACT

Competent rubber dam use increases both operating speed and treatment quality. In many instances, however, the application of rubber dam clamps may cause immediate and/or postoperative discomfort, and some dentists continue to use this as a "justifiable" excuse for not employing rubber dam. This paper reviews the iatrogenic potential of metal rubber dam clamps, and introduces a new cushioning technique that makes use of light-cured provisional material.

SOMMAIRE

Un usage compétent des digues en caoutchouc accélère l'exécution et la qualité des traitements. Dans plusieurs cas, le crampon pour les maintenir en place cause de l'inconfort durant et après les traitements. Aussi, ceux qui répugnent à les utiliser donnent-ils cette excuse pour se justifier. Dans cet article, on revoit les problèmes que les crampons des digues en caoutchouc peuvent causer et on présente une nouvelle technique de coussinage à l'aide d'un matériau provisoire polymérisé.

Introduction

Regardless of one's position on rubber dam, there is no question that its use allows for unrivalled isolation perfection.

Despite this, "rubber dam use for restorative dentistry is far too low."¹

Earlier attempts by dental educators to encourage the use of rubber dam focused on the quality of the restorative product.²⁻⁶ Next came the "accident prevention" era, which stressed the safety provided by the routine use of rubber dam isolation.⁷⁻¹¹ Although the use of rubber dam isolation as a shield against the aspiration or swallowing of endodontic instruments was advocated in the dental literature,^{8,10} little attention was directed toward extending this protection to include all restorative procedures. This has since been addressed, however, and new, innovative application methods have ensured that there are now only a few applications that cannot be contained with rubber dam isolation.¹²⁻¹⁵

Of late, it has been recognized that rubber dam offers an adjunctive method of reducing the spread of infectious disease in the dental office and, more importantly, that it provides barrier protection at the source of microbial contamination.¹⁶⁻²⁰ With the increased emphasis on rubber dam's role in protecting the dental team against the risk of infection transmission from the ever-growing number of hepatitis and human immunodeficiency virus (HIV) carriers, barrier protection has become the focus of the renewed "rubber dam drive."²¹⁻²³ It is therefore conceivable that the routine status of rub-

ber dam isolation will continue to be associated with quality patient care,²⁴ and it is clear that the promotion of rubber dam as a valuable adjunct to restorative dentistry must continue in earnest.

Gordon Christensen found that the profession's reluctance to routinely employ rubber dam stemmed from a perception that it was associated with "time loss, patient pain, extra cost, frustration and irritation."¹ His report, together with many others, refutes this association and suggests that competent rubber dam use increases operating speed and treatment quality.

Nonetheless, clamp application can, in many instances, cause immediate and/or postoperative discomfort, and it continues to be cited as a valid argument against the use of rubber dam. There is also evidence that iatrogenic damage can, and does, take place at the point of clamp application.

This article will review the iatrogenic potential of metal rubber dam clamps, and introduce a new cushioning technique that relies on visible light-cured (VLC) provisional material.

Rubber Dam Clamps

Reduced to its simplest form, classical rubber dam isolation involves making a series of holes in a sheet of latex rubber and then slipping these holes over the crowns of the teeth that are to be isolated from the oral cavity. The peripheral edges of the latex sheet are

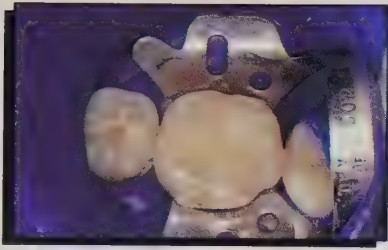


Fig. 1a: The focus of this restorative effort was on providing the patient with a composite resin of maximum functional longevity with the least possible amount of postoperative sensitivity.

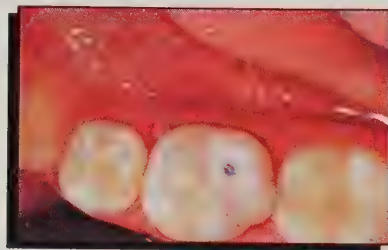


Fig. 1b: On removal of the rubber dam, it is obvious that the integrity of the fully-sealed occlusal restoration has been achieved at the expense of the gingival tissues. There is a clear and pressing need for cushioning of the attaching blades of rubber dam clamps.

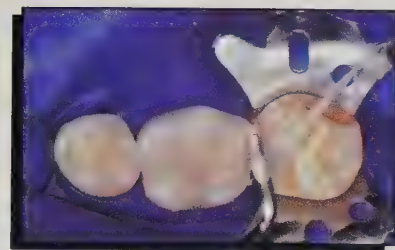


Fig. 2: Sectional isolation accommodating bonding of ceramic and composite restoration of the fractured disto-buccal cusp. Note how the clamp has been customized through selective grinding of the jaws to provide circumferential contact, with the blade portion contacting the tooth surface evenly throughout its length. This is done using the working model as reference.

then stretched onto an extra-oral frame that retracts the circumoral soft tissues and improves access to the isolated area. This stretched and framed sheet has a tendency to be dislodged by its own elasticity, and it needs to be securely attached to the anchor teeth within the isolated area.

Rubber dam clamps are the most commonly used method of securing the rubber dam over the teeth in the posterior portion of the working field. The design and application of metal clamps has changed very little since the Elliott design of 1878.²⁵ A rubber dam clamp consists of a jaw on each side, which carries the tooth attachment blades and, in the winged variety, the dam engaging projections. A sufficiently elastically-strainable connecting bow imparts a gripping force to the attaching blades, which rest against the teeth.

All clamps can be divided into two main groups according to the jaw design:²⁶

1. Retentive clamps — those with four point-contact blades. The jaws are directed gingivally to engage the four proximal surfaces of the retaining curvature of the tooth. These clamps are indicated when the retaining curvature of the tooth surfaces is not present.
2. Bland clamps — those with flat circumferential contact blades that point toward each other and grasp the tooth at or above the gingival margin. In this design, the blade portion has no

projections and is intended to contact the tooth surface evenly throughout its length.

The efficacy of clamps depends on their ability to grip the tooth firmly and resist dislodgement of the stretched latex sheet. Ideally, clamps should be applied to grip the enamel, but the structural form of the tooth does not readily allow the engagement of this tissue because it is too hard. In addition, the recoil closure of the clamp causes the gripping edges of the blades to produce a sliding movement in an apical direction. This is due to the convexity of the opposing surfaces in the vertical plane on which it is being placed.²⁷ Even with careful placement, the clamp may impinge on and traumatize the periodontium (**Fig. 1**).^{28,29} Using the working model as a reference, clamps can be customized through selective grinding of their jaws to provide circumferential contact, with the blade portion contacting the tooth surface evenly throughout its length (**Fig. 2**).

Most operative textbooks advocate the four point contact of the "retentive" style, because bland clamps are less retentive. Four point contact can be achieved by customizing the clamp through selective grinding of the jaws. Nonetheless, in clinical practice four-point contact is occasionally unachievable. The tenuous grip of three-point contact poses the greatest iatrogenic potential, as the partially-stabilized clamp can rotate across the fulcrum line, caus-

ing its non-contacting jaw to be driven into the cervical taper of the tooth where it injures the cervical hard and soft tissue structures (**Fig. 3**).

Rearranging the contact zone of the clamp/tooth should always be done with the clamp engaged in the clamp forceps. The elastic tension of the clamp is partially relieved and the clamp is manoeuvred into the proximal cervical undercut areas. It is important to release the tension when both jaws are correctly seated.

Iatrogenic Potential

Soft Tissue

The literature reveals a lack of definitive research into the frequency of abusive clamp placement and the resulting consequences on the soft tissues. In the one and only animal study, clamps were purposefully applied so that their jaws penetrated well into the gingival sulcus. The six-week results of this study showed that there was no difference in the downgrowth of the junctional epithelium, and the authors concluded that there is "no evidence to discourage the careful and appropriate use of rubber dam and clamps."³⁰ As with all animal studies, extrapolation and caution are juxtaposed, and clinicians are reminded of our responsibility to non-maleficence (i.e. to do no further harm).

Foreman's national survey of sealant use revealed that 26.8 per cent of the 265 respondents reported injuries during sealant



Fig. 3: In real-time clinical practice, four-point contact is more often the goal. The tenuous grip of three-point contact poses the greatest iatrogenic potential. The partially stabilized clamp can rotate across the fulcrum line and the non-contacting jaw can tip into the cervical taper of the tooth where it injures the cervical hard and soft tissue structures.

placement. More to the point, 71.4 per cent of the injuries were due to rubber dam clamp placement.³¹ Many of our restorative efforts are accomplished within the comfort of full pulpal anesthesia and only partial soft tissue anesthesia. Profound gingival anesthesia relies on direct gingival infiltration, and is notoriously painful irrespective of the technique used. It is therefore understandable that clinicians are reluctant to resort to infiltration for clamp application *per se*, and that patients are routinely advised to "hang in" for a minute or two during the initial discomfort. This is generally considered acceptable, given the perception that the tissue damage is minimal and transient. At the extreme, it has previously been suggested that the attached gingiva be clamped in instances of inadequate coronal tooth structure.³² The gingival laceration depicted in **Fig. 1b** is representative of the soft tissue damage seen in real-time restorative dentistry.

Most soft tissue lacerations heal without any permanent untoward effects, but they are without doubt a source of discomfort. In addition, many of our restorative procedures rely on placing the clamp several teeth away from the tooth being restored (in some instances to the nonanesthetized contralateral quadrant).

Cementum and Dentin

Jeffrey and Woolford conducted an investigation into the possible iatrogenic damage caused by metal rubber dam clamps using spec-

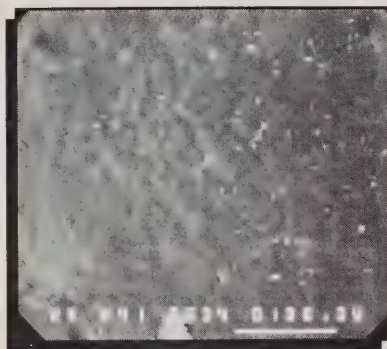


Fig. 4a: An electron photomicrograph of the surface of the tooth prior to testing of the area (marker = 100um, field width = 370um).

cial apparatus and SEM.²⁷ The pre- and post-test electron photomicrographs of **Fig. 4** (reproduced here with permission) showed that damage in the form of depressive disruption of the surface can occur when metal rubber dam clamps are applied to cementum or dentin. Loads of 1.0 and 2.5 kg were calculated as being the lower and upper limits of closure force, generated clinically, when the bow is opened with a clamp forceps. The concave depression of **Fig. 4b** was the result of an easily attainable clinical load of 1.0 kg applied to the tooth via a pointed section of the clamp. Jeffrey and Woolford made a plea for manufacturers to produce a less traumatic clamp and for clinicians to avoid a point contact wherever possible. It is significant that the penetrative damage produced when the clamp possessed an appositional edge of 1.5 mm (as opposed to a point contact) was at worst only of a slight nature.

Cervical Porcelain Margins

A scanning electron microscopic (SEM) study has confirmed that the placement of rubber dam clamps on PFM restorations results in damage to the porcelain surface at the site of retainer contact.³³ The photomicrographs reproduced here (**Fig. 5**) clearly demonstrate this destruction at 1000x magnification. In addition to the central area of destruction seen on the postplacement photomicrographs, irregular, fingerlike projections, extending peripherally, were also

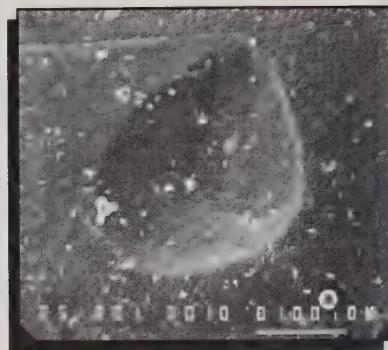


Fig. 4b: An electron photomicrograph of the surface of the area shown in **Fig. 2a** after loading a point contact with a force of 1.0 kg (marker = 100um, field width = 450um). Note the depressive damage afforded by the point contact of the rubber dam clamp.

revealed. These are areas of concern not only because of their plaque inducing potential³⁴ (likewise in cemental disruption), but also because crack propagation may result in catastrophic destruction of the restoration. Porcelain is increasingly becoming the material of choice for indirect esthetic restorations, and clinicians are advised to use alternative retainers in these instances or to use some form of cushioning technique to protect the restorative/tooth/gingival complex.

A New Cushioning Technique

Materials

There are a number of flexible VLC temporaries available: E-Z Temp (Cosmedent, Chicago, Ill.); Fermite-N (Ivoclar North America Inc., Amherst, N.Y.); Intertemp (E&D Dental Products Inc., Somerset, N.J.); Tempo-Rex (Sci Pharm, Triad VLC). VLC periodontal wound dressings such as barricade (LD Caulk, Milford, DE) and LC Block-out resin (Ultradent Products, Inc., Salt Lake City, Utah) are practical alternatives. It is obviously possible to use any biocompatible material from the litany of acrylic and composite restorative resins. However, the majority of these resins are too brittle and tedious to remove from the interproximal areas.

Technique (Figs. 6a to 6d)

If study models are available, they should be used to select the appropriate size of retainer, as

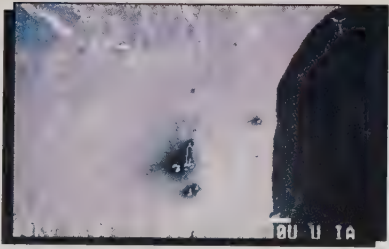


Fig. 5a: An electron photomicrograph of porcelain prior to rubber dam placement (original magnification X 100).

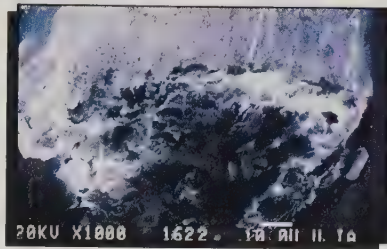


Fig. 5b: Post-test electron photomicrograph of porcelain showing a large area of destruction with irregular linear extensions of cracks (original magnification X 1000).



Fig. 6a: Occlusal view of clamp application. Lingual jaw contacts the tooth surface evenly throughout its length. The buccal jaw is cushioned along its length with light cured Fermite-N.

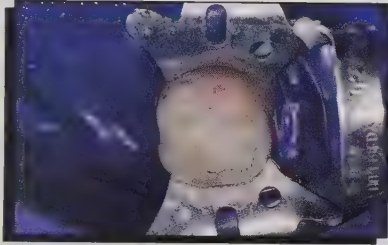


Fig. 6b: The dam is applied in the customary manner with full stability of the clamp during the restorative procedure.



Fig. 6c: Restoration complete, an explorer is used to disengage the "cushion" from its buccally wedged interproximal position.

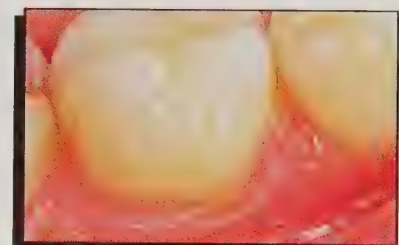


Fig. 6d: Immediate postoperative close up of the buccal cervical area displaying successful cushioning during clamp application. Note the preexisting dentin abrasion lesion which prompted the application of a cushion of temporisation material.

well as to note the application points/surfaces. Alternatively, clamp selection is based on the manufacturer's list and the dentist's practical experience.³⁵

The safety floss ligated clamp is engaged in the clamp forceps and positioned circumferentially to the anchor tooth. The clamp tension is not released at this point, but the attachment blades of the jaws of the clamp are approximated and noted. If it is anticipated that contact will be confined to the enamel apical to the height of the axial contour, then the clamp is released from the forceps and the forceps are removed in an occlusal direction. If contact is anticipated as being potentially injurious to the dentin, cementum, gingival tissues and/or restorative margins, then the forceps engaged clamp is removed from the mouth.

A length of visible light-cured temporary material is extruded alongside the noted contact areas. The newly released Fermite-N (Aug. 1995³⁶) is less sticky than its predecessor (Fermite original), and it is more easily manipulated when the pad of a gloved finger is lightly dipped in alcohol. The "cushion" of Fermite-N is flattened out, tak-

ing care to press the material into the embrasure areas both mesially and distally. The material is then light-cured, the clamp is seated and checked for stability, and the dam is attached to the anchor tooth in the customary manner.

On completion of the procedure, the clamp is removed and the "cushion" is released with the help of an explorer. The embrasure areas are flossed to confirm complete removal, which is usually not a problem as these VLC materials are flexible and readily disengaged from the embrasure areas.

Advantages

- Expands the isolation repertoire. Limits of the isolated working field are no longer confined to the anesthetized sextants. Conservative restorative procedures, which are traditionally "quickly" completed within the compromised access of cotton roll isolation (out of concern for the inevitable discomfort of clamp application), are readily isolated and completed within the luxury of a rubber dam. This is particularly true with pedodontic applica-

tions. Many of our conservative restorations can be painlessly accomplished without local anesthesia. Clinicians are understandably reluctant to use a rubber dam where clamp retention in the reduced height and cervical taper of the deciduous dentition demands subgingival encroachment.

- Promotes patient acceptance. The immediate and postoperative discomfort associated with gingival nicks and compression is avoided. This, in turn, promotes patient acceptance toward routine rubber dam use at future visits.
- Avoids iatrogenic damage. The potential detrimental effect of the clamp jaws on the dentin, cementum, junctional epithelium and cervical restorative surfaces is likewise avoided.
- As a precaution against bacteremia in cardiac valvular disease. This is a limited but important application of rubber dam clamp cushioning, as it allows for the atraumatic application of rubber dam clamps in instances



Fig. 7: Sectional isolation using a plastic rubber dam clamp on the maxillary first molar. While the iatrogenic potential is greatly reduced the discomfort of a gingivally approximated plastic clamp is no less than its conventional metal counterpart.

of conservative restorations where rubber dam can safely replace the compromised isolation of cotton rolls.

Disadvantages

- Time loss. Extra step in the isolation routine.
- Cost. At present, the system relies on materials designed for temporization. The current retail price, per gram, in U.S. dollars is: Fermit-N \$6.66; E.Z Temp \$8.13; Tempo-Rex \$3.06; Triad VLC \$3.52/rope. For example, each 2.5 gram tube of Fermite-N would yield about eight large buccal cushions at a cost of \$2.08/cushion.
- Lack of seal. The interproximal location interrupts the circumferential seal (secondary retention)²⁴ of the dam/tooth interface. This is generally of concern only when the tooth receiving the restorative attention is also serving as the anchor tooth.

Alternative "Cushioning" Methods

Plastic Rubber Dam Clamps

Disposable plastic rubber dam clamps are available from Henry Schein Inc. (Port Washington, N.Y.) and Société Endo Technic (Marseilles, France). Selection is limited to two sizes in both series, and while the iatrogenic potential is greatly reduced due to the plastic component, the discomfort of a gingivally approximated plastic clamp is no less



Fig. 8: The soft thermoplastic cashew shaped "Cushee" modules, which are grooved on their inner surfaces, are slipped over the tooth attachment blades of the jaws of the clamp prior to clamp application.

than its conventional metal counterpart (Fig. 7).

Cushees

The "Cushee" system introduced by Graves³⁷ is an innovative method of protecting the hard and soft tissues during clamp application. The modules are available in two sizes (Dr. R.G. Graves, Victoria, B.C.). The soft thermoplastic cashew-shaped modules, which are grooved on their inner surfaces, are slipped over the tooth attachment blades of the clamp jaws prior to clamp application (Fig. 8). This is a useful adjunct to painless clamp application. The main disadvantage is that it is limited to teeth where the surface engagement is in the cervical area below the height of contour.

Rubber Plunger Protection

The author re-introduced the idea of gingival protection using the rubber plungers of discarded anesthetic carpules in an article on access and isolation problem-solving in endodontics.³⁸ The stability of the plunger on the point of a retentive clamp is ensured by drilling a small pilot hole in the end of the plunger and then twisting the plunger into position. The limitations of this system relate to the bulkiness of the cushioned clamp and, as with the "cushee" system, its use is restricted to teeth with adequate proximal undercuts.

Summary

Rubber dam isolation is here to stay and will undoubtedly con-

tinue paramount in the quest for restorative and operative excellence. Microscopic evaluation of materials, the application of these materials, and the clinical competence of their delivery has led to an appreciation of the need for caution in our restorative efforts. Despite this recognition, the original clamp design and application of the late 19th century continues along its outmoded macroscopic route. SEM studies provide incontrovertible evidence of the injurious effects of these clamps. Photomicrographs aside, the fact of the matter is, as every practising clinician knows, rubber dam clamps can cause immediate and postoperative discomfort. For this reason alone clinicians are encouraged to cushion the application points in all instances where it is both practical and warranted. ■

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Dr. Liebenberg is in private practice in North Vancouver

Reprint requests to: Dr. W.H. Liebenberg, 201-2609 Westview Dr., North Vancouver, B.C., V7N 4M2.

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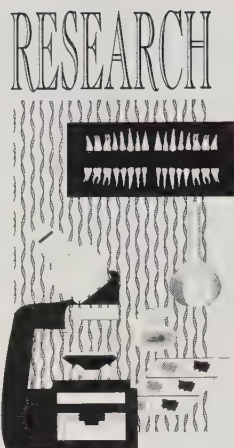
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Prosthetic Relining and Dietary Counselling In Elderly Women

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Jean-Marc Brodeur, DDS, PhD

Michel Boivin, MD, FRCP(C)

Nicole Leduc, PDt, PhD

Michel Lévy, DMD, MPH

Richard H. Taché, DDS, MS

ABSTRACT

A reduced consumption of hard-textured fibrous foods may promote the development of digestive disturbances in more susceptible elderly people who wear prostheses having deficient masticatory function. The purpose of this study was to evaluate the effects of a program combining denture relining and dietary counselling on the masticatory performance, fibre intake, and prevalence of digestive symptoms in elderly women with low chewing efficiency. This program was provided to 55 women between 55 and 74 years of age. Chewing ability was assessed quantitatively with the Swallowing Threshold Test Index (STTI), and qualitatively according to the participants' experience in chewing five specific foods. Nutritional data were collected using a food frequency questionnaire. The mean value of the STTI was significantly increased at three weeks and at six to nine months after completion of relining by 37 and 31 per cent, respectively. Subjects included one more food in their diet at the end of the six- to nine-month period only. Fibre intake from vegetables was significantly increased by 18 per cent, while colonic and gastrointestinal symptoms were both reduced. Prosthetic relining in-

creased the masticatory performance of elderly women, but not to a functional level. In addition, dietary counselling stimulated subjects to eat foods that had previously been avoided. These observations suggest that the improvement of chewing efficiency, combined with dietary counselling, could reduce the presence of digestive symptoms.

SOMMAIRE

Une consommation moindre d'aliments durs et fibreux amènerait le développement de troubles gastro-intestinaux chez certaines personnes âgées plus sensibles porteuses de prothèses non fonctionnelles. Le présent projet visait à évaluer les effets d'un programme combinant un regarnissage prothétique et de l'assistance diététique sur la performance masticatrice, la consommation de fibres et la fréquence de symptômes gastro-intestinaux chez la femme âgée démontrant une efficacité masticatrice déficiente. Ce programme a été appliqué chez 55 femmes âgées de 55 à 74 ans. L'efficacité masticatrice a été évaluée de façon quantitative à l'aide du Swallowing Threshold Test Index (STTI) et de façon qualitative à partir d'un indice en fonction de cinq

aliments spécifiques. Les données nutritionnelles ont été recueillies à partir d'un questionnaire de fréquence alimentaire. La valeur moyenne du STTI était significativement augmentée 3 semaines et 6 à 9 mois après la fin du regarnissage de 37 et 31 pour cent, respectivement. Les sujets ajoutaient à leur régime un aliment de plus à la fin de la période de 6 à 9 mois seulement. L'ingestion moyenne de fibres provenant des légumes était significativement augmentée de 18 pour cent tandis que les symptômes coliques et gastro-intestinaux étaient tous deux atténués. Le regarnissage prothétique a augmenté la performance masticatrice des femmes âgées, sans toutefois atteindre un niveau fonctionnel. L'assistance diététique encourage les sujets à réintroduire des aliments difficiles à mastiquer. Les résultats observés suggèrent qu'une meilleure efficacité masticatrice combinée à de l'assistance diététique pourraient réduire la présence de symptômes digestifs.

Introduction

Good nutrition is recognized as the cornerstone of preventive medicine, especially in older people.¹ Reduced chewing ability, even self-reported, has been shown to be a

major determinant in food perception and restrictions.²⁻⁵ More recently, poor mastication has been associated with lower intakes of dietary fibre⁶ and the genesis of digestive disturbances.⁶⁻⁷ These reductions were mainly attributed to a diminished consumption of hard-textured fibrous foods like fruits and vegetables.⁶ Furthermore, women seemed more prone to developing such disorders.

It is therefore logical to assume that an improvement in the ability to chew in elderly persons with full dentures would increase the fibre intake and possibly prevent digestive symptoms. Minor corrections of masticatory ability could be less traumatic, more effective, and less expensive for the aged person than undergoing treatment for digestive disorders. Moreover, dietary counselling has been identified as an essential means of enhancing specific food changes when restoring chewing efficiency.^{5,6,8}

In the present investigation, we examined the effects of a pluridisciplinary program that combined simple and inexpensive prosthetic (denture relining) and dietetic (dietary counselling) interventions. The consequences of the program on the masticatory performance, fibre intake and prevalence of digestive symptoms were observed in elderly women who had non-functional dental prostheses.

Subjects and Methods

Advertisements in daily and local papers were used to invite women with mastication problems to participate in a study where free denture relining and dietary counselling would be provided. Other stipulated criteria included:

- 1) age between 55 and 74 years,
- 2) present prostheses for at least one year, and
- 3) completely edentulous for at least two years.

Of the more than 500 calls received, only 152 satisfied these preliminary requirements. General details of the study were explained and all participants agreed to come to the dental clinic for further selection examinations

Table 1

Characteristics Of Participants (n=38)

Variable	Mean $\pm$ SD or Percentage
Age (yrs.)	64.9 $\pm$ 5.6
Living alone	47.4
Education (yrs.)	8.9 $\pm$ 3.3
Smoking habits	7.9
Complete edentation before age 40	65.8
Age of the maxillary prosthesis (yrs.)	5.5 $\pm$ 3.4
Age of the mandibular prosthesis (yrs.)	5.4 $\pm$ 3.4
Last dental visit (yrs.)	4.7 $\pm$ 3.5
Masticatory performance (STTI)	40.0 $\pm$ 19.0
Chewing ability index (/5)	2.5 $\pm$ 1.2
Poor retention/stability index	81.6
Good to average retention/stability index	18.4

*n=32

Data were collected from questionnaires, by interviews, and from a dental examination. The first questionnaires concerned the subjects' prosthetic history and qualitatively evaluated their chewing ability. This was accomplished using the index developed by Leake,⁹ by asking: "Are you ordinarily, or would you be able to chew or bite ..."

- 1) fresh carrot or celery sticks?
- 2) fresh lettuce or spinach salad?
- 3) steaks, chops, or firm meat?
- 4) boiled peas, carrots, or green or yellow beans?
- 5) a whole fresh apple without cutting?

A score of 0 to 4 on this index indicated a chewing disability. Afterward, a trained dentist assessed the retention and stability of the prostheses according to Kapur,¹⁰ the need for a relining treatment, and the patient's masticatory performance (using the Swallowing Threshold Test Index (STTI) of Chauncey et al).³

The STTI is determined by instructing each participant to chew three grams of fresh carrot until it is

ready to be swallowed. The chewed particles are then expectorated into a U.S. standard No. 5 sieve (4.0 mm grid size). The score is obtained by dividing the volume of test food passing through the sieve by the total volume of recovered food, multiplied by 100. A score below 80 per cent indicates a non-functional masticatory performance.

Two other questionnaires were administered by a trained dietitian to assess the subject's digestive history and nutritional status. The medical questionnaire was designed to reveal information on surgeries of the gastrointestinal tract, digestive diseases, and drug intake, as well as the frequencies and intensities over the last two weeks of symptoms specific to the esophagus, the stomach, the small intestine and the colon. Dietary data for the last month were collected using the food frequency questionnaire of Krondl et al.¹¹ Sociodemographic factors such as age, education, smoking habits, marital and residential status were also considered.

Table II

Effects Of the Relining Treatment On the Chewing Efficiency

Global comparisons	N	PRE	POST	P-value
STTI:				
initial vs mid-term	23	42.0 ± 18.6	57.7 ± 24.6	< 0.05
mid-term vs final	28	55.6 ± 23.9	56.2 ± 22.8	N.S.
initial vs final	29	41.9 ± 18.7	54.7 ± 20.0	< 0.01
Chewing ability index:				
initial vs mid-term	38	2.5 ± 1.2	2.8 ± 1.9	N.S.
mid-term vs final	38	2.8 ± 1.9	3.4 ± 1.4	< 0.05
initial vs final	38	2.5 ± 1.2	3.4 ± 1.4	< 0.005

Exclusion criteria included: denture relining not pertinent, weight exceeding the 90th percentile, or functional denture according to the STTI. Details of the study were again carefully explained to all participants. Each of them provided informed written consent and was free to withdraw at any time.

A relining with occlusal equilibration was proposed as the prosthetic treatment. The procedure yields a more intimate contact between the denture pieces and the osteomucous bases, thereby improving the retention and the stability of the prostheses. The intervention was realized with the TRIAD 2000 System, which allows a relining with pre-dosed material (TRIAD Reline VLC Hi-Flow) in only one visit. This was done after polymerizing the contours and extensions with a VLC intra-oral lamp (Visible Light Cure). Occlusal equilibration, if needed, was performed on a Galetti articulator. Finally, short control visits were scheduled to provide further corrections and obtain optimal comfort.

The dietetic treatment consisted of dietary counselling. This therapeutic intervention offers an individualized service that stimulates the subject to eat recommended nutrient intakes according to his or her specific state of health. The dietary counselling provided in this research project focused primarily on an increased fibre intake from fruits and vegetables. Following a nutritional evaluation and the analysis of a three-day food in-

take diary, the dietitian identified specific problems and developed various treatment strategies for each subject. Suggestions ranged from teaching subjects healthy dietary habits or new methods of food preparation, to advising them to consume frequent small meals, or to substitute foods for others higher in fibre, etc.

Statistical Methodology

The statistical evaluation was performed with tests for paired data. Associations between the interventions and dependent variables were assessed with the paired *t* test and McNemar chi square for means and proportions, respectively. Each dependent variable was analyzed globally and then stratified according to potentially confondant variables.

Results

Sixty-seven participants were admitted to the combined program, but only 55 received both treatments. Six subjects were excluded by the clinician-dentist, who reversed the examiner-dentist's decision regarding the pertinence of relining. The other participants withdrew voluntarily because of their fear of pain or concern about the number of visits required. Of the 55 women remaining, 37 came to a mid-term examination three weeks after the last control visit following relining, and 38 attended the final examination six to nine months following the conclusion of treatment. Of the

17 participants who missed the final visit, eight had new dentures and nine refused to come.

In all, 38 subjects, aged between 55 and 74 years (mean ± SD, 64.9 ± 5.6 yrs.), completed the program. As shown in **Table I**, half of them (47.4 per cent) were living alone while the other half were living with their husband and/or other members of the family. The mean number of years of education was 8.9 years, and 7.9 per cent of subjects regularly smoked 10 cigarettes or more per day. The mean age of the maxillary and the mandibular prostheses was 5.5 years and 5.4 years, respectively. Sixty-six (65.8) per cent of the subjects were completely edentulous before the age of 40. At the beginning of the study, more than 80 per cent (81.6) of the subjects demonstrated a poor retention/stability index according to Kapur. The mean masticatory performance (STTI) for the 32 subjects who were able to chew carrot at the beginning of the study was 40 per cent. According to Leake's index of chewing ability, subjects were able to chew a mean of 2.5 foods from the five listed.

The effects of prosthesis relining on the subjects' chewing efficiency are shown in **Table II**. Mean STTI values increased significantly at three weeks and at six to nine months after the relining treatment, with values rising by 37 and 31 per cent, respectively. Although no significant improvement was noticed at the end of the prosthetic treatment, the mean

Table III

Changes Associated With the Relining Combined To the Dietary Counselling

Global comparisons	N	PRE	POST	P-value
Total fibre (in grams):				
bread and cereals	38	4.7 ± 2.4	5.0 ± 2.5	N.S.
fruits and vegetables	38	11.4 ± 4.9	12.8 ± 4.9	< 0.05
nuts and legumes	38	0.8 ± 0.9	0.7 ± 1.1	N.S.
all sources	38	16.8 ± 6.6	18.5 ± 6.0	N.S.
Composed index of:				
esophageal symptoms	38	1.7 ± 2.9	1.1 ± 2.0	N.S.
gastrointestinal symptoms	38	3.1 ± 5.3	0.6 ± 1.6	< 0.01
colonic symptoms	38	1.8 ± 2.6	0.8 ± 1.6	< 0.05

value of the five-item index was increased significantly by one food item (3.4 foods on 5) at the end of the six- to nine-month period ($p < 0.01$). Forty-five per cent of subjects had a good to average mean retention/stability index at the end of the program ($p < 0.05$), compared with only 18 per cent at the beginning.

The changes associated with relining in combination with dietary counselling are presented in **Table III**. Total fibre intake from fruits and vegetables increased by 18 per cent at the end of the program ($p < 0.05$). Furthermore, total fibre intake was statistically higher when subjects were between 65 and 74 years of age ($p < 0.01$), living alone ($p < 0.05$), or following the dietitian's advice ($p < 0.05$). No clinical difference in mean soluble and insoluble fibre intakes were observed.

The mean composite index (the product of the frequency and the intensity) of esophageal symptoms was decreased, but not statistically, following the combined program (**Table III**). However, the mean composite index of gastrointestinal and colonic symptoms was significantly reduced, declining by 81 per cent ($p < 0.01$) and 56 per cent ($p < 0.05$), respectively. The stratification shows that these last two indexes remained diminished when subjects had a poor retention/stability index at the beginning of the study ($p < 0.05$), when subjects showed a good to average retention/stability index at the end

of the study ($p < 0.05$), and when subjects followed the dietitian's advice ($p < 0.05$).

Discussion

Final masticatory performance values in this study have seldom reached the functional levels (STTI > 80 per cent) stipulated by Chauncey et al.³ Indeed, long-time wearers, like our subjects, show a severe atrophy of residual alveolar ridges. It would have been an utopian view to hope for a complete restoration of the retention and stability of prostheses, especially for the mandible. Nonetheless, the current investigation has demonstrated that relining rapidly improved the masticatory performance over a sustained time period. Furthermore, 63 per cent of the 38 subjects who completed the program were satisfied or very satisfied with the denture relining, and 55 per cent noticed some improvement in mastication.

Prosthetic relining also contributed to a wider dietary selection as subjects were eating one more fibrous item from Leake's five-item index. Since this last observation was made at the end of the program, and not immediately following the relining, it reinforces the assertion that relining must be provided in combination with dietary counselling. Indeed, despite an improved masticatory efficiency, subjects did not immediately change their food choice — it was necessary for the dietitian to en-

courage participants to try foods that they considered very difficult or impossible to chew.

The majority of aged Canadians wish to maintain their autonomy. This may explain why elderly people are generally eager to eat well. The long-time food habits of adults are very difficult to modify. However, perceived health benefit is a strong motivator in food selection. Dietary counselling represents a therapeutic approach that offers professional and individually-given dietary advice by a trained dietitian. This approach is well-adapted to an elderly population, as shown by the high level of satisfaction observed in this study. Indeed, 95 per cent of the 38 subjects who completed the program were satisfied or very satisfied with the advice of the dietitian, even though many of them felt that they already had good dietary habits. Fifty-seven per cent indicated that they made some changes in their regular diet.

Slightly higher fibre intakes were observed at the end of the program. It is possible that relining, which did not allow greatly improved masticatory ability, could not favor marked elevations of fibre intakes even though dietary counselling was also provided. In our study, statistical differences were noted in the total fibre intake of fruits, and particularly of vegetables. Dietary counselling focused primarily on higher fibre intake via an increased consumption of fruits and vegetables.

Similar results were observed by Sandström and Lindquist.⁵ These authors recorded marginal nutritional effects, such as slight increases in crisp bread and fresh fruit intake, after treatment with fixed tissue-integrated prostheses in the mandibular jaw. Nevertheless, subjects were offered the possibility of a wider choice of foods, thereby improving oral comfort and well-being.

Results suggest that prosthetic relining and dietary counselling may have beneficial effects on digestive disorders. It seems that our pluridisciplinary program was more specific in reducing gastrointestinal and colonic symptoms. The increase in fibre intake could be partly responsible for the improvement noted in digestion and elimination processes, as the inclusion of adequate dietary fibre has been related to the reduction of several gastrointestinal disorders.¹²⁻¹³ Furthermore, low intakes of fruits and vegetables have been associated with higher risks of developing cancer.¹⁴ On the other hand, teaching healthy food habits (eating slowly, drinking liquids, reducing fat ingestion) may have played an important role in the attenuation of some digestive symptoms. ■

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Dr. Marie Olivier is a public health dentist, St. Luc Hospital, Montreal.

Dr. Michel Lévy is a public health dentist, St. Luc Hospital, Montreal.

Ms. Danielle Laurin is a research assistant, preventive medicine department, St. Luc Hospital, Montreal.

Dr. Jean-Marc Brodeur is director, social and preventive medicine department, University of Montreal.

Dr. Michel Boivin is a gastroenterologist on the staff of St. Luc Hospital, Montreal.

Ms. Nicole Leduc is a researcher at the University of Montreal.

Dr. Richard H. Taché is a professor, faculty of dental medicine, University of Montreal.

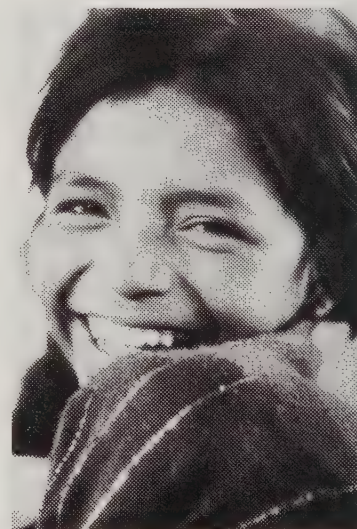
Reprint requests to: Dr. Jean-Marc Brodeur, Director, Social and Preventive Medicine Department, Faculty of Medicine, University of Montreal, P.O. Box 6128, Station A, Montreal, Que. H3C 3J7.

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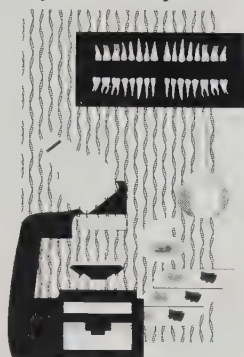


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Support



RESEARCH



An SEM Examination Of Etched Dentin and the Structure Of the Hybrid Layer

K.C. Titley, BDS, LDS, RCS(Eng.), Dip. Pedo., M.Sc.D., FRCD(C)

D.C. Smith, B.Sc., M.Sc., PhD, D.Sc., FRSC(UK)

R. Chernecky

B. Maric, M.Sc., PEng

A. Chan, DDS, Dip. Pedo., M.Sc.

ABSTRACT

The clinical requirements of dentin bonds are that they should be non-permeable to oral fluids, seal dentinal tubules, protect the pulp, and be long lasting and durable. Dentin bonding systems that use acidic agents to remove the smear layer are currently being used. Acid conditioning not only removes the smear layer, but also demineralizes the surface of the intertubular dentin and produces intratubular demineralization and funnelling. A dentin bond is produced when hydrophilic resin monomers infiltrate the dentinal tubules and collagen of the demineralized intertubular zone, producing a hybrid layer. The use of a critical point drying technique and SEM allows a clear visualization of the structure of the hybrid layer. This study showed that currently used hydrophilic resin monomers are unable to completely infiltrate the demineralized zone, and it is speculated that this failure could contribute to microleakage and influence the long-term durability of the bond. It is also apparent that these bonds depend on the mechanical investment of collagen by the infiltrating monomer. Since none of the unfilled resins tested seem capable of completely infiltrating the demineralized col-

lagenous zone, the degree of demineralization produced by the commercial acid concentrations in current use is questioned. More dilute acids than those available commercially are shown to reduce both the degree and depth of demineralization, and we suggest that the resultant thinner layer may lend itself to more complete resin infiltration of the collagen.

SOMMAIRE

Dans l'exercice clinique, on exige que les adhésifs pour la dentine soient étanches, scellent les tubules dentinaires, protègent la pulpe et soient durables. On utilise actuellement des adhésifs contenant des produits acides pour éliminer la boue dentinaire. L'acide élimine non seulement cette boue, mais déminéralise aussi la surface de la dentine intertubulaire et entraîne une déminéralisation et la formation de canaux intratubulaires. Une liaison à la dentine se produit lorsque des monomères de résine hydrophile s'infiltrant dans les tubules dentinaires et le collagène de la région intertubulaire déminéralisée en produisant une couche hybride dont on peut clairement voir la structure avec une technique de séchage au point critique et un MBE. L'étude effectuée a démon-

tré que les monomères de résine hydrophile utilisés ne parviennent pas à s'infiltrer complètement dans la région déminéralisée et on se demande si ce défaut ne compromet pas l'étanchéité de l'adhésif et sa durabilité à long terme. Par ailleurs, il est évident que ces adhésifs dépendent de l'envahissement mécanique du collagène par les monomères qui s'y infiltrent. Comme aucune des résines non-chargées testées semblent pouvoir s'infiltrer complètement dans la région collagène déminéralisée, on se pose des questions touchant le taux de déminéralisation causée par les concentrations acides commerciales qu'on utilise actuellement. On a démontré que des acides plus dilués que ceux offerts sur le marché réduisent le taux et l'ampleur de la déminéralisation. Aussi pense-t-on que la couche plus fine qui en résulte se prête à une meilleure infiltration du collagène par la résine.

Introduction

Dentin bonding systems that promise high bond strengths, improved physical properties and esthetics continue to be developed and are finding their way into the dental marketplace. The majority of these systems are advertised as being

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simple to use and capable of achieving acceptable bonds, often in conditions of elevated relative humidity. In spite of these developments, a full understanding of the mechanisms of bonding composite resins to dentin and the optimization of these bonds remains obscure.¹ The clinical requirements of these bonds, however, are quite definite: they should be non permeable to oral fluids; effectively seal the dentinal tubules to prevent postoperative sensitivity and protect the pulp; and be long lasting and durable.

Dentin is a heterogeneous vital tissue that is subject to continuous physiological and pathological changes in composition and microstructure.^{2,4} It is the hard tissue portion of the pulp-dentin complex and forms the bulk of the tooth. Mature dentin is chemically composed of about 70 per cent inorganic material, 20 per cent organic materials, and 10 per cent water by weight. The inorganic material is primarily hydroxyapatite, and the organic material is Type 1 collagen with fractional inclusions of other proteins. About 56 per cent of the inorganic or mineral phase is within the collagen.³ Dentin is also a permeable tissue, and is composed of fluid-filled microscopic tubules that allow a bi-directional movement of materials from the oral cavity across dentin to the pulp, and vice versa. Variations in this movement depend on depth, which influences the amount of intertubular and peritubular dentin and tubule cross section.⁵ These structural and compositional variations influence the optimization of dentin bonding.

The mechanical manipulation of dentin with burs during cavity preparation, or with silicon carbide paper in the laboratory for the preparation of flat surfaces for tension and shear bond strength testing, results in the formation of a smear layer.⁶⁻⁸ The smear layer is composed of granular debris that completely covers the intertubular dentin and plugs tubule orifices,^{7,9} which reduces dentin permeability.¹⁰ The smear layer is apparently anchored only to solid dentin, and can easily be removed with acidic

or chelating agents or by ultrasound.⁷ Removal of the smear layer results in an increase in dentin permeability both to oral and pulpal fluids.⁹

Since optimum conditions for bonding have not yet been fully defined, dentin bonding systems have been developed using agents that can interact with an intact or partially modified smear layer; remove the smear layer; bond to a modified-treated smear layer; or demineralize and infiltrate dentin.^{10,11} Recently, the emphasis has been on agents that remove the smear layer.

The focus in this laboratory has been on dentin bonding agents that completely remove the smear layer and demineralize both intertubular and intratubular dentin, producing what has been termed the demineralized zone,¹² or the resin-dentin interdiffusion zone.¹³ Using an improved critical point drying method and the scanning electron microscope (SEM), we have been able to examine the ultra-structure of this zone. The results have led to a better understanding of dentin bonding mechanisms. This paper will summarize our findings.

Materials and Methods

Tooth Material

The tooth material used in these studies consisted of freshly-extracted, non-carious maxillary and mandibular third molar teeth, sterilized by gamma radiation (Cobalt source 2.5 mega rads), and freshly-extracted bovine incisors obtained ex-abattoir. On receipt of the teeth from the radiation department or abattoir, the roots were cut off, the coronal pulps removed and the crowns stored in distilled water at 4°C. The teeth were used within three months of harvesting.

Surface Preparation

Using SiC paper, the labial or lingual surfaces (labial surfaces only in the case of the bovine teeth) were ground flat on a water-irrigated grinding wheel to expose the dentin immediately underlying the enamel-dentin junction. The final test surface was prepared using #600 grit SiC paper. Groups of four human and four bovine teeth

were prepared in this way to examine the effects of etching agents and the infiltration of unfilled bonding resin. Groups of eight bovine teeth per resin system were prepared and used in the shear bond strength test.

Effect of Etching Agents

The exposed human or bovine dentin was treated with one of the following materials:

- 35 per cent phosphoric acid gel for 60 seconds (3M Canada Inc.),
- 32 per cent phosphoric acid gel for 15 seconds (Bisco, Itasca, Ill.),
- 10 per cent phosphoric acid gel for 15 seconds (Bisco, Itasca, Ill.),
- 10 per cent maleic acid gel for 15 seconds (3M Canada Inc.),
- 2.5 per cent aqueous solution of maleic acid for 45 seconds, and
- Scotchbond 2 (3M Canada Inc.).

Scotchbond 2 contains both 2.5 per cent maleic acid and HEMA. These materials, with the exception of the 2.5 per cent aqueous solution of maleic acid, are commercially available in bonding kits currently on the market. Each material was used in accordance with manufacturer's instructions, and teeth were washed for 30 seconds in running tap water following application. Two specimens from each group were dried with compressed air and allowed to air dry for two hours. The remaining two specimens were placed in water prior to critical point drying (CPD).

In a subsequent experiment, four human and four bovine teeth were exposed to 10 per cent maleic acid gel (3M Canada Inc.) for 15 seconds, washed in tap water for 30 seconds, immersed in a solution of ethanol HEMA (prepared by adding 30 g of HEMA to 70 per cent alcohol) for 30 seconds, and then washed in tap water for 30 seconds. These specimens were then placed in water and designated for CPD.

Infiltration of Unfilled Bonding Resin

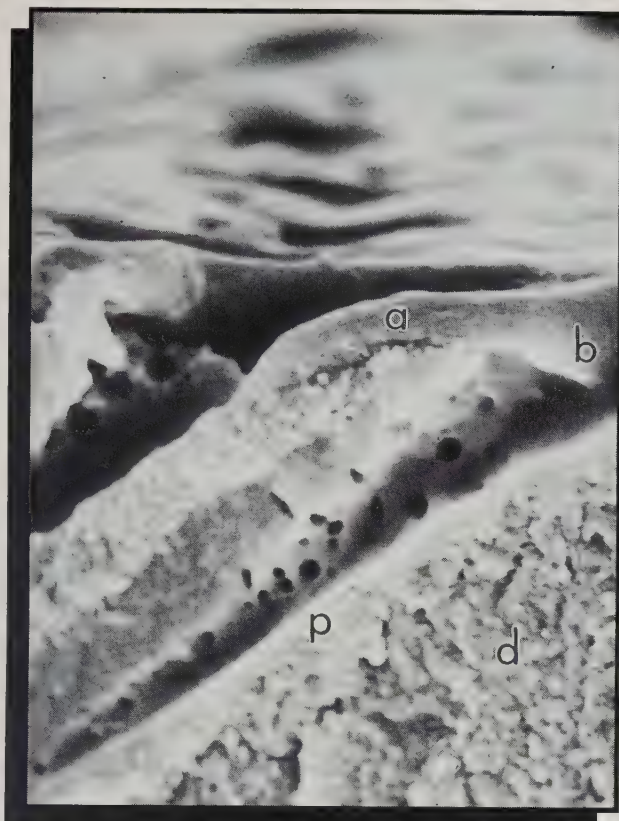


Fig. 1: SEM (x 5,000) Dentin etched with 10 per cent maleic acid for 15 seconds, specimen air dried. Demineralized dentin showing that the collagen layer has collapsed (a), tubule orifice is partially constricted by collapse of the demineralized collagen layer (b), normal dentin (d), peritubular dentin (p) (FW 11 μ m).



Fig. 2: SEM (x 7,000) Dentin etched with 10 per cent maleic acid for 15 seconds, specimen CPD. Demineralized dentin collagen layer intertubularly has not collapsed (a), tubule orifice remains patent and collagen can be seen (b), normal dentin (d), peritubular dentin (p) (FW 8 μ m).

Further groups of human and bovine teeth were prepared and etched with the phosphoric acid and maleic acid preparations described in the previous section. Care was taken not to desiccate the etched surface. Two layers of Scotchbond Multipurpose (SBMP) primer were applied, and the corresponding SBMP adhesive unfilled bonding resin was photocured according to the manufacturer's instructions (3M Canada Inc.). Two specimens were allowed to air dry and the other two were immersed in water for CPD as described previously.

Shear Bond Strength Tests

Groups of eight bovine incisor teeth were used to test each of the materials mentioned below. The prepared dentin surfaces were etched and primed according to the manufacturer's instructions using the All Bond 2 etch and non-etch (Bisco, Itasca Ill.), Scotchbond 2, Scotchbond Multipurpose (3M Canada, Inc.), and Prisma Universal Bond 3 (L.D. Caulk, Milford, DE.)

dental resin systems. Care was taken not to desiccate the treated dentin surfaces. Using gelatin cylinders of constant surface area and a jig system developed in this laboratory, the respective bonding resin for each system and a cylinder of Silux Plus™ or Z 100 resin composite (3M Canada Inc.) was photocured to the dentin surface. The specimens were stored in distilled water at 37°C for periods of either one, seven, or 180 days, after which time they were shear tested to failure on an Instron Model 4301 Universal testing machine. The bond strength results obtained have been reported elsewhere. The test teeth and their detached resin cylinders were stored in distilled water at 4°C.

SEM Preparation

Using a novel technique of preparing the teeth for freeze fracturing, the incisal and gingival edges of the bovine teeth were notched and the lingual surface cut through to the pulp space using a diamond wheel. A similar technique was employed for the human molar

teeth, using either a labial or lingual notch on the side opposite to the one that had been treated. The teeth used to study the effects of etching agents or infiltration of UBR were notched prior to experimentation, while the teeth used in the shear bond strength test were notched after the resin cylinder had been detached. The points of a pair of cotton forceps were then compressed and inserted into the pulpal space at the gingival area of the tooth. The impaled tooth was placed into liquid nitrogen, where the freezing process, and the force created when the compressed forceps expanded, caused the tooth to fracture between the notches. The freeze fractured halves and detached resin cylinders selected for CPD were then immediately immersed in absolute alcohol for two hours for fixation and dehydration prior to CPD. Some of these halves, however, were selected at random, immediately fixed in 10 per cent neutral buffered formalin for 24 hours, washed in run-

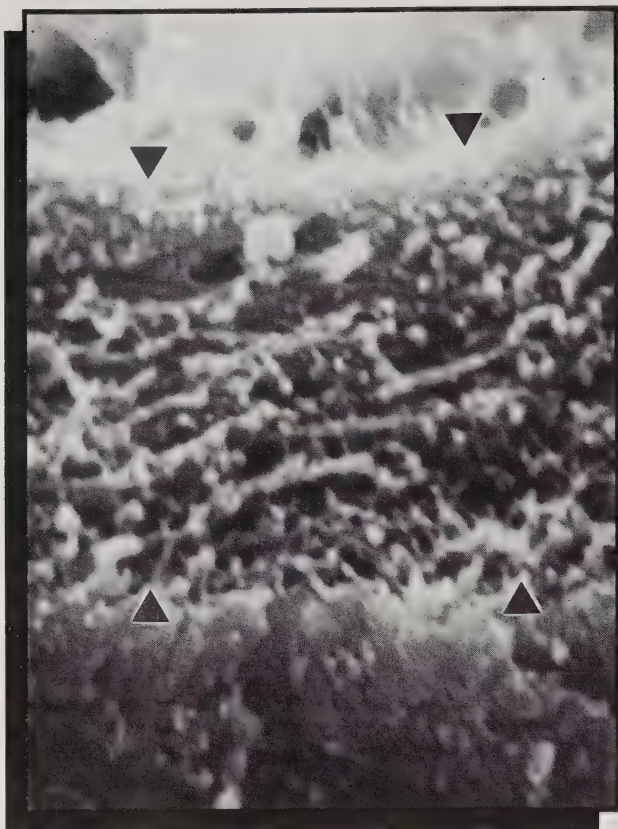


Fig. 3a: SEM (x 15,000) Dentin etched with 10 per cent maleic acid for 15 seconds, specimen placed in 100 per cent alcohol for two hours before CPD. Note that the collagen fibres can be clearly seen in the demineralized dentin (FW 3.7 μ m).

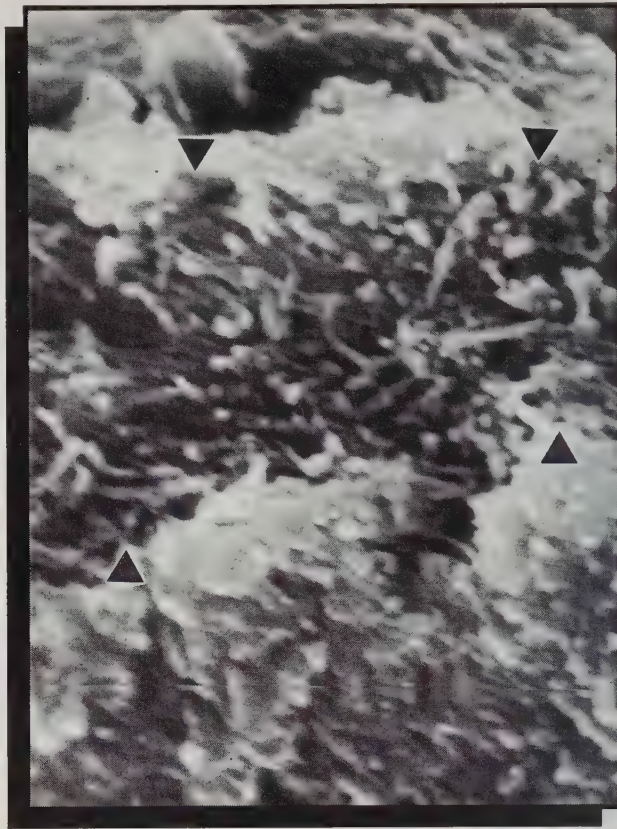


Fig. 3b: SEM (x 15,000) Dentin etched with 10 per cent maleic acid for 15 seconds, specimen placed into 10 per cent neutral buffered formalin for 24 hours, passed through a graded series of alcohols to 100 per cent, then CPD. Note that the collagen in the demineralized dentin layer is similar to those seen in **Fig. 3a** (FW 3.7 μ m).

ning tap water for two hours, and subsequently dehydrated up to 100 per cent by passing them through a graded series of alcohol, prior to CPD. Each air dried or CPD specimen was then mounted on an aluminum SEM stub, sputter coated with 10 to 15 nm of gold-palladium in a Polaron E5100 SEM coating unit, and finally examined with a Hitachi S-2500 SEM at an operating voltage of 10 kV. Areas of specific interest were examined and photographed at magnifications that best illustrated the area under examination.

Results

SEM examination showed that the application of various concentrations of acids to the dentin surface removed the smear layer and produced varying degrees of intertubular and intratubular demineralization. More severe demineralization occurred in bovine teeth as compared with human teeth, and it is hypothesized that this reflects a species difference in dentin structure

and mineral composition.

An examination of the naturally air-dried SEM specimens treated with phosphoric and maleic acids demonstrated an intertubular demineralized collagen layer that had collapsed upon itself, thereby producing a dense surface layer with no porosity seen between the collagen (**Fig. 1**).

When viewing the dentinal tubules in a longitudinal section, the acidic preparative treatments produced a funnelled appearance whereby the tubules were greater in width at the surface or sub-surface, and tapered to normal peritubular dentin after approximately 5 μ m. There was also some evidence that the tubule orifices were enlarged, but that the enlargement had, to some extent, been reduced by a slight encroachment of the collapsed intertubular collagen layer. This may be due, in part, to the dentinal tubule orientation of the freeze-fractured prepared dentinal surface.

In contrast, the CPD specimens

examined in the SEM revealed a demineralized intertubular surface zone that was preserved as a porous layer in which collagen fibrils were clearly visible (**Fig. 2**). There appeared to be no difference in SEM appearance between specimens that had been fixed in formalin and dehydrated to 100 per cent through graded alcohols, and those that had been dehydrated by immediate placement in absolute alcohol for two hours (**Figs. 3a** and **3b**).

In viewing and comparing the phosphoric acid samples, it appeared that the more concentrated the acid, the greater the degree of demineralization in both the inter- and intratubular dentin. Despite its lower concentration, the 2.5 per cent maleic acid component of Scotchbond 2 produced a similar pattern of inter- and intradentinal demineralization to that already described, and the visualization of the collagen fibres was identical.

All of the acidic CPD preparations showed similar intratubular changes, in which the peritubular



Fig. 4a: SEM (x 10,000) Dentin etched with 10 per cent maleic acid for 15 seconds, two coats SBMP primer applied, light cured SRMP resin. Specimen was CPD. Note that the resin can be seen to partially infiltrate the collagen of the demineralized dentin layer (fc), other areas remain unfilled (c). Unfilled resin (r), normal dentin (d), resin tag (rt) (FW 5.5 μ m).



Fig. 4b: SEM (x 25,000) High magnification of inset in Fig. 3a. Specimen was CPD, showing partial infiltration of collagen (fc) and failure of the resin to completely infiltrate the demineralized layer (c). Unfilled resin (r), normal dentin (d) (FW 2.2 μ m).

dentin was dissolved exposing collagen in intratubular orifices. The funnelled appearance was also apparent except that the tubule orifices remained patent, since there was no collapse and resultant encroachment of the collagen fibres of the demineralized intertubular layer as is caused by natural air drying.

At low magnifications, SEM examination of the air-dried specimens in which unfilled bonding resin had been applied and photocured prior to natural air drying revealed that unfilled resin had penetrated both the demineralized intertubular layer and the dentinal tubules as a homogeneous layer of the hybrid zone. When viewed at a higher magnification, the penetration of the intertubular layer by the unfilled resin appeared to be incomplete, as there was evidence of gaps, particularly at the normal dentin demineralized zone interface. In the CPD specimens, however, these unfilled gaps were shown to contain the collagen fi-

bres of the demineralized dentin, thus confirming that the unfilled bonding resin had failed to completely infiltrate the demineralized dentin zone (Figs. 4a and 4b).

SEM examination of the HEMA and maleic acid contained in Scotchbond 2 priming agent demonstrated a reduction in the degree of surface collagen collapse of the etched dentin in the naturally air-dried specimens. The effect of HEMA in both the Scotchbond 2 and the ethanol/HEMA treated specimens, i.e. increased porosity between the collagen fibres, was demonstrated more effectively when the specimens were prepared by the CPD method. In these specimens, there was little or no surface collapse, and collagen fibrils could be seen projecting above the etched dentin surface (Fig. 5).

SEM examination of the failed shear bond tested specimens (both teeth and resin cylinders) showed that bond failure was a combination of both adhesive and cohesive

failure (Fig. 6). In areas where cohesive failure had occurred, fractured resin tags could be clearly seen at the orifices of the dentinal tubules. Adhesive failure was characterized by networks of collagen, which not only appeared in the intertubular areas on the tooth, but were also shown to be adhering to the detached, filled resin cylinder from the shear test. This finding clearly illustrated that the penetration of unfilled resin into the etched dentin zone was incomplete.

Discussion

These results show that excessive desiccation of etched dentin by compressed air or by prolonged natural air drying for SEM specimen preparation causes a collapse of the intertubular and intratubular collagen, which results in an apparent reduction of surface porosity. It was noted, however, that when HEMA-containing primers were used, there appeared to be a lesser degree of collagen collapse.

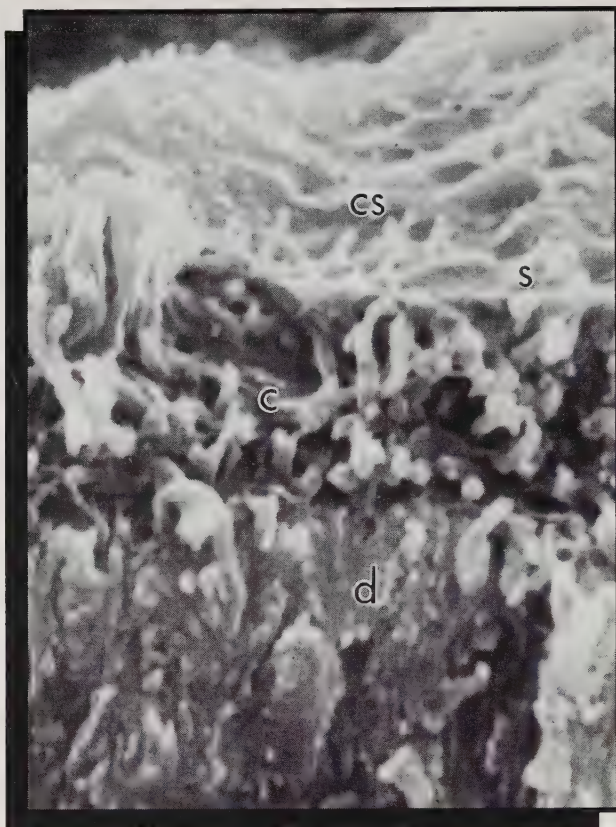


Fig. 5: SEM (x 25,000) Dentin etched with 10 per cent maleic acid for 15 seconds. Ethanol HEMA was placed on the dentin surface for 30 seconds, specimen was CPD. Note that there was no evidence of surface collagen collapse (s), collagen mesh work was clearly seen in the demineralized zone (c), collagen fibrils are seen projecting above the demineralized surface (cs), normal dentin (d) (FW 2.2 μ m).

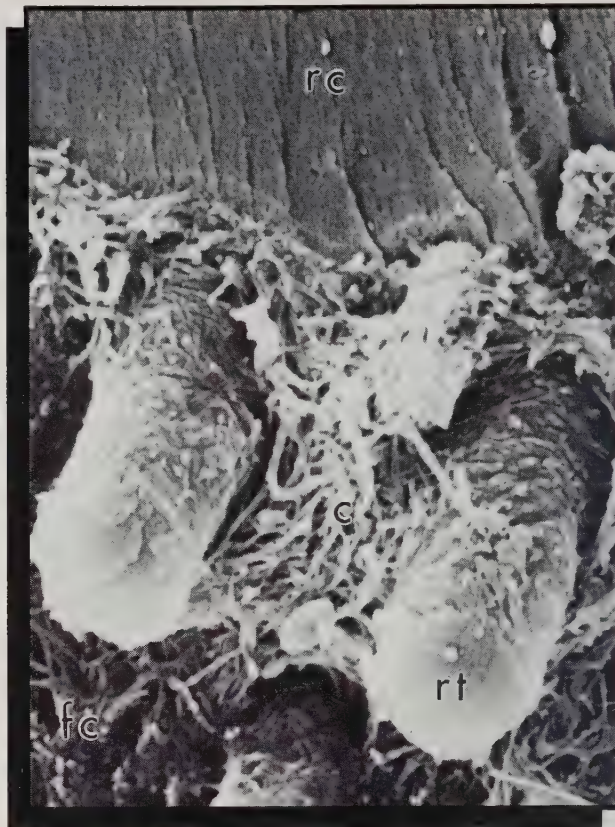


Fig. 6: SEM (x 5,000) Detached SBMP resin cylinder after a Shear Test, specimen was CPD. Note the unfilled intertubular collagen (c) between the resin tags (rt). Note areas of filled collagen (fc) and grooves on the resin tags, indicating the failure of resin to totally invest the demineralized collagen. Filled resin cylinder (rc) (FW 11 μ m).

This finding supports the work of Sugizaki,¹⁴ who found that hydrophilic primers such as HEMA can expand the collapsed collagen surface. By way of contrast, specimens prepared by the CPD method displayed a patent collagen network with a minimal loss of surface porosity. A simple comparison between CPD and prolonged natural air drying is the wrinkled appearance that air drying gives to the prune or raisin.¹⁵ The CPD method reduces the surface tension forces in specimen preparation, as compared to the gross distortion caused by the natural air drying process.

It has been stated that fixation in formalin, and the dehydration of specimens by passing them through a series of graded alcohols, is necessary prior to CPD.^{16,17} The results produced in this laboratory suggest that because the depth of demineralization produced by the acids used for etching is minimal, adequate dehydration and fixation of

collagen in an etched or shear test failed specimen can be achieved by simple immersion in absolute alcohol for two hours prior to CPD. As a result, it is felt that CPD specimens prepared in this manner have enabled us to study the structure of the so-called hybrid layer,¹⁸ or resin interdiffusion zone, in greater detail.¹³

The finding and hypotheses of Van Meerbeek and his colleagues¹³ that the resin interdiffusion zone is composed of collagen and unfilled resin is supported by our findings. They have shown that decalcification of the intertubular dentin surface layer causes the unsupported collagen matrix to collapse and bulge out laterally, thus resulting in a constriction of the tubule orifice. Like Sugizaki,¹⁴ they have also shown that hydrophilic monomers such as HEMA have the ability to raise the unsupported and/or collapsed collagen network to almost its original dentin surface level. The fact that the original dentin surface is

not restored is evidenced by the constriction produced in the resin tags as they pass through the interdiffusion zone, before they enter the dentinal tubules.

This suggests that a degree of collapse still exists in the interdiffusion zone, which may act as an impediment to resin diffusion despite the improvement in wettability that hydrophilic monomers impart to the collagen. Van Meerbeek and his colleagues¹³ also hypothesize that the diffusion of resin monomers into the decalcified layer diminishes with depth. Pashley¹⁹ has recently suggested that resin infiltration of the demineralized zone may not extend completely to the normal dentin interface, thus resulting in an unprotected, uninfiltated zone of weakened, exposed collagen. The combination of using the CPD method of specimen preparation and SEM examination of the shear fractured interface clearly shows that this uninfiltated and weak-

ened zone of exposed collagen does exist. We have been able to clearly demonstrate — and this has also been recently reported by Erickson and Glasspoole²⁰ — that unfilled resin only partially infiltrates and invests the demineralized collagen, leaving unfilled collagen at the normal dentin-demineralized zone interface. Even the application of multiple layers of priming agents, which in theory should increase wettability and hence penetration, produced no visible evidence of greater unfilled resin penetration, although it does significantly increase shear bond strength.¹²

Further evidence of unfilled resin's inability to fully infiltrate the demineralized zone was provided by SEM examination of CPD specimens that were shear tested to failure. This enabled us to view both the tooth and sheared resin button. In all areas where adhesive failure occurred, a collagen network could clearly be seen both on the dentin surface and the sheared resin cylinder. The failure of unfilled resin to fully infiltrate the demineralized layer indicates a possible inherent weakness in resin-dentin bonds as they are currently prepared, confirming the hypothesis of Pashley¹⁹ and the recent findings of Tagami et al.²¹ It should also be noted that these bonds are prepared using the high relative humidity methods suggested by Kanca^{22,23} and Gwinnet.²⁴ As a result, we ensured that the maximum intertubular surface porosity and tubule orifice diameters were maintained during the bonding process.

As has already been demonstrated, surface porosity and tubule orifice diameters are compromised by excessive air drying following dentin etching and washing. This observation is supported by the hypothesis of Pashley et al,¹⁶ which states that there is a collapse and condensation of the unsupported surface collagen fibres following acid etching. This condensed surface layer restricts the porosity of the dentinal surface, particularly if it is air dried, and as a result the ability of resin to penetrate the surface layer is compromised. Keeping the etched surface wet reduces the de-

gree of collapse, and the use of hydrophilic monomers such as HEMA aids in the re-expansion of collagen fibres that have collapsed. The fact remains, however, that acid-etching dentin removes the mineral support from the collagen network, with the result that a degree of collapse is inevitable, and brings with it a concomitant loss of surface porosity.

We have stated that the clinical requirements for dentin bonds are that the resin systems must seal the dentin tubules, and be non-permeable, long lasting and durable. As a result of our findings, we feel that the incomplete infiltration of unfilled resin into the demineralized zone could contribute to microleakage and affect the long-term durability of the bond. Preliminary long-term bond strength data suggest that reduction in bond strength may occur and that it may be attributable to the degradation of this interface.¹ Although it is possible that the remineralization of the collagen network that remains uninfiltated by resin could occur *in vivo*, this has not yet been demonstrated.

Our observations indicate that with the resin systems examined here, an interpenetrating micro-mechanical bond is established between the unfilled resin and collagen in the demineralized dentin zone. Although multiple applications of priming agents appear to increase the strength of the bond, we have found little evidence to suggest that the wettability of the collagen is enhanced by this process, since there was no observable evidence of increased unfilled resin infiltration despite a significant increase in bond strength.¹² As a result of our findings, we question whether the extensive degree of demineralization produced by the commercial acid concentrations in current use is necessary, particularly since none of the tested unfilled resins seem capable of completely infiltrating the demineralized zone. We hypothesize that more dilute acids will produce a lesser degree of demineralization, and that the resultant thinner, and presumably less decalcified, layer may better lend itself to more complete infiltration

by unfilled resins. Work is currently under way in our laboratory to test this hypothesis. ■

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Dr. Titley is a professor in the department of pediatric dentistry, faculty of dentistry, University of Toronto.

Dr. Smith is professor emeritus, and former chair, in the department of biomaterials, faculty of dentistry, University of Toronto.

Mr. Chernecky is a senior laboratory technician, department of biomaterials, faculty of dentistry, University of Toronto.

Dr. Chan is a former graduate student, department of pediatric dentistry, University of Toronto.

Ms. Maric is a former research chemist, department of biomaterials, faculty of dentistry, University of Toronto.

Reprint requests to: Dr. K. Titley, Department of Pediatric Dentistry, Faculty of Dentistry, University of Toronto, 124 Edward St., Toronto, Ont. M5G 1G6.

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Dental Local Anesthetic

LIDOCAINE 2% and EPINEPHRINE 1:50,000 Injection

LIDOCAINE 2% and EPINEPHRINE 1:100,000 Injection (lidocaine and epinephrine injection USP)

INDICATIONS: Lidocaine and epinephrine injection is indicated for production of local anesthesia by nerve block or infiltration.

CONTRAINDICATIONS: Lidocaine is contraindicated in patients with a known history of hypersensitivity to local anesthetics of the amide type, or to other components of the solution. Local anesthetics should not be used when there is inflammation and/or sepsis present at the injection site. Epinephrine is contraindicated in patients with thyrotoxicosis or severe heart disease.

WARNINGS: Resuscitative equipment, oxygen and other resuscitative drugs should be available for immediate use should an emergency situation arise. To minimize the likelihood of intravascular injection, aspiration should be performed prior to injection of the local anesthetic. If blood is aspirated, the needle must be repositioned until no return of blood can be elicited by aspiration. Note, however, that the absence of blood in the syringe does not assure that intravascular injection has been avoided. Lidocaine and epinephrine solutions contain sodium metabisulfite which may cause severe allergic reactions.

PRECAUTIONS: General: Repeated doses of lidocaine may cause significant increases in blood levels due to slow accumulation of the drug or its metabolites. Dehydrated, elderly patients, acutely ill patients, and children should be given reduced doses. Lidocaine should also be used with caution in patients with epilepsy, severe shock or heart block. Patients with peripheral vascular disease and those with hypertensive vascular disease may exhibit exaggerated vasoconstrictor response. Ischemic injury or necrosis may result. Cardiovascular and respiratory vital signs and the patient's state of consciousness should be monitored after each local anesthetic injection. Lidocaine should also be used with caution in patients with impaired cardiovascular function. Amide anesthetics have not been proven to cause malignant hyperthermia, but the dentist should be aware of this unlikely possibility. Lidocaine should be used with caution in persons with known drug sensitivities. Patients allergic to para-aminobenzoic acid derivatives (procaine, tetracaine, benzocaine, etc.) have not shown cross sensitivity to lidocaine.

Use in the Head and Neck Area: Small doses of local anesthetics injected into the head and neck area, including retrobulbar, dental and stellate ganglion blocks, may produce adverse reactions similar to systemic toxicity seen with unintentional intravascular injections of larger doses. Confusion, convulsions, respiratory depression and/or respiratory arrest, and cardiovascular stimulation or depression have been reported. These reactions may be due to intra-arterial injection of the local anesthetic with retrograde flow to the cerebral circulation. Patients receiving these blocks should have their circulation and respiration monitored and be constantly observed.

Information for Patients: Patients should be informed of the possibility of temporary loss of sensation and muscle function following infiltration or nerve block injections. They should also be advised to exert caution to avoid inadvertent trauma to the lips, tongue, cheek mucosae or soft palate when these structures are anesthetized. Ingestion of food should be postponed until normal function returns. Patients should be advised to consult their dentist if anesthesia persists or if a rash develops.

Clinically Significant Drug Interactions: Administration of local anesthetic solutions containing epinephrine to patients receiving monoamine oxidase inhibitors or tricyclic antidepressants may produce severe, prolonged hypertension. Phenothiazines and butyrophenones may reduce or reverse the pressor effect of epinephrine. Concurrent use with a beta adrenergic blocking agent (ie: propranolol) may result in dose dependent hypertension and bradycardia with possible heart block. Vasopressor drugs (for the treatment of hypotension related to obstetric blocks) and ergot-type or oxytocic drugs may cause severe, persistent hypertension or cerebrovascular accidents. Serious cardiac arrhythmias may occur if preparations containing epinephrine are employed in patients during or following the administration of chloroform, halothane, cyclopropane, trichloroethylene or other halogenated compounds. Concurrent use of these agents should generally be avoided. When concurrent therapy is necessary, careful patient monitoring is essential. Lidocaine should be used with caution in patients receiving antiarrhythmic drugs, such as tocainide, since the toxic effects are additive. Cimetidine has been shown to reduce clearance of intravenously administered lidocaine. Caution should be taken if cimetidine is administered concurrently with lidocaine. Phenytoin and other antiepileptic drugs such as phenobarbital, primidone and carbamazepine appear to enhance the metabolism of lidocaine but the significance of this effect is unknown. Lidocaine and phenytoin pose additive cardiac depressant effects.

Pregnancy: There are no adequate and well-controlled studies in pregnant women. However, rat reproduction studies have shown there is no harm to the fetus.

ADVERSE REACTIONS: Adverse experiences following the administration of lidocaine are similar in nature to those observed with other amide local anesthetic agents. Serious adverse experiences are generally systemic in nature, the following, being those most commonly reported:

Central Nervous System: CNS manifestations are excitatory and/or depressant and may be characterized by lightheadedness, nervousness, apprehension, euphoria, confusion, dizziness, drowsiness, tinnitus, blurred or double vision, vomiting, sensations of heat, cold or numbness, twitching, tremors, convulsions, unconsciousness, respiratory depression and arrest. The excitatory manifestations may be very brief or may not occur at all, in which case the first manifestation of toxicity may be drowsiness merging into unconsciousness and respiratory arrest.

Cardiovascular System: Cardiovascular manifestations are usually depressant and are characterized by bradycardia, hypotension, and cardiovascular collapse, which may lead to cardiac arrest.

Allergic: Allergic reactions are characterized by cutaneous lesions, urticaria, edema or anaphylactoid reactions.

Neurologic: Neurologic reactions eg: persistent neurologic deficit may be related to the technique employed, the total dose of local anesthetic administered, the particular drug used, the route of administration, and the physical condition of the patient.

DOSAGE AND ADMINISTRATION: When used for dental anesthesia the dosage of lidocaine 2% and epinephrine depends on the physical status of the patient, the area of the oral cavity to be anesthetized, the vascularity of the oral tissues, and the technique of anesthesia. For most routine dental procedures, lidocaine 2% and epinephrine 1:100,000 is preferred. However, when greater depth and a more pronounced hemostasis are required, a 1:50,000 epinephrine concentration should be used. For infiltration and/or mandibular block, initial dosages of 1-5 mL of lidocaine 2% and epinephrine 1:50,000 or 1:100,000 are usually effective. For a single tooth, in children under 10 years of age, usually 0.9-ml of lidocaine 2% and epinephrine per procedure will suffice. In maxillary infiltration, this amount will often suffice for the treatment of two or even three teeth. Utilizing a mandibular block, satisfactory anesthesia achieved with this amount of drug will allow treatment of the teeth in an entire quadrant.

MAXIMUM RECOMMENDED DOSAGES: Adult: For normal healthy adults, individual doses of lidocaine and epinephrine should be kept below 500 mg and should never exceed 7 mg/kg of body weight.

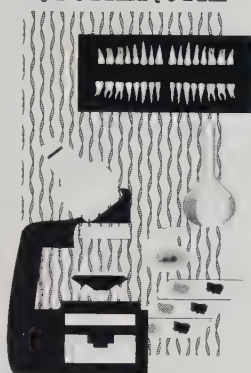
Children: It is difficult to recommend a maximum dose of any drug for children since dosage varies as a function of age and weight. For normally developed children under ten years, the maximum dose may be determined by standard pediatric drug formulas. In any case, the maximum dose of lidocaine and epinephrine should not exceed 3 mg/kg of body weight.

HOW SUPPLIED: Lidocaine 2% and Epinephrine 1:100,000 and Lidocaine 2% and Epinephrine 1:50,000 are available as sterile solution in 1.8 mL cartridges, containers of 50.



Full prescribing information is available upon request.
 Kodak Canada Inc., 3500 Eglinton Avenue West, Toronto Ontario, M6M 1V3

RECHERCHE



Les canines incluses — traitement chirurgico-orthodontique : L'expérience de Laval

Jean-Yves Turcotte, DDS, MRCD(C)

Guy Maranda, DDS, FRCD(C)

Richard Breton, DMD

Louis Haché, DMD

Jacques Houde, DMD

SOMMAIRE

Il arrive que la ou les canines permanentes au maxillaire supérieur ne font pas éruption normalement sur l'arcade et demeurent incluses. Nous avons fait la revue des dossiers de patients s'étant présentés avec cette anomalie et déterminé quels traitements ils ont subi, et en chirurgie et en orthodontie, à l'aide d'un appareil amovible.

Mots clés : canines incluses maxillaire supérieur — traitement chirurgico-orthodontique de canines incluses.

ABSTRACT

It happens that maxillary cuspids do not follow their normal path of eruption and remain impacted. We have reviewed the files of patients presenting with this anomaly and determined which surgical and orthodontic treatments they have received, with the help of a removable appliance.

Key words: impacted maxillary cuspids — surgico-orthodontic treatment of impacted cuspid teeth.

Introduction

L'inclusion de dents permanentes est un phénomène fréquent en dentisterie. Si le diagnostic en est aisé, surtout depuis le développement des techniques radiographiques, le traitement, par contre, reste encore dis-

cuté, et la diversité des attitudes thérapeutiques montre bien que des difficultés ne sont pas encore résolues.

Dans ce texte, est appelée "dent incluse" une dent dont la genèse s'effectue mais qui n'apparaît pas sur l'arcade, qu'il s'agisse d'une inclusion vraie (manque de force d'éruption) ou d'un enclavement (dent bloquée par une barrière physique quelconque).

L'article comprend une étude clinique portant sur 96 canines incluses au maxillaire supérieur traitées par remplacement chirurgico-orthodontique entre les années 1978 et 1992 aux départements de chirurgie et d'orthodontie de la Faculté de médecine dentaire de l'Université Laval. Dans l'ordre décroissant de fréquence, les troisièmes molaires, les canines maxillaires et les prémolaires sont les dents les plus atteintes. L'attention se porte sur les canines supérieures plutôt que sur les canines inférieures. Ces dernières, dans le segment postérieur (3,4,5, tel que défini en orthodontie), sont le plus souvent les premières à faire leur apparition et, de ce fait, peuvent bénéficier du précieux "Lee way space" avant que les prémolaires fassent leur apparition. Les canines supérieures, au contraire, sont le plus souvent les dernières à faire éruption et doivent se satisfaire de l'espace restant. Toutefois, plu-

sieurs autres causes que le manque d'espace peuvent amener l'inclusion de la canine supérieure.

Incidence, épidémiologie et étiologie

Selon les auteurs, de 1,4 à 8,6 p. cent des canines supérieures demeurent incluses et le problème est plus souvent unilatéral que bilatéral. L'inclusion bilatérale a été rapportée dans 17 à 45 p. cent des cas. La dent est le plus souvent incluse du côté palatin, plus rarement du côté labial. Ici aussi, toujours selon les auteurs, les statistiques varient : position palatine/position labiale allant de 2,8:1 jusqu'à 14,7:1.

Des causes locales et des causes générales peuvent être évoquées. Dans ce dernier cas, non seulement la canine supérieure est touchée mais toutes les dents le sont.

Causes locales :

- manque d'espace : dysharmonie dento-maxillaire, macrodontie
- malposition du germe dentaire associé au fait que la canine supérieure a un patron d'éruption compliqué et long
- traumatisme dentaire
- rétention prolongée de la primaire
- perte prématurée de la primaire
- infection de la primaire
- habitude de posture
- dent surnuméraire

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- présence de kyste, odontome, tumeur, corps étranger sur le chemin de l'éruption
- ankylose
- fermeture précoce de l'apex
- densité de la muqueuse (muqueuse épaisse, fibreuse)
- densité de l'os
- anomalie de la latérale (agénésie, microdontie)
- fente labio-palatine.

Causes générales :

- hypovitaminose
- désordres endocriniens
- chérubisme
- carences nutritionnelles
- syndromes : Gardner, dysostose cléidocrânienne, maladie de Hunter
- hérédité.

Signes, symptômes, complications et importance de la canine

Le patient se plaint rarement d'un symptôme relié à sa condition; on a rapporté, à l'occasion, des cas de névralgie. Il consulte donc rarement, d'autant plus que la canine lactéale reste en place. La découverte d'une canine incluse est donc le plus souvent faite par le dentiste, lors d'un examen de routine. Toutefois, il faut faire attention aux diagnostics hâtifs. Les 13 et 23 émergent dans la cavité buccale environ à 11,5 ans, +/- 2 ans; elles devraient donc être palpées, hautes dans le vestibule, au-dessus de la canine primaire, vers l'âge de 10 ou 11 ans. Il faut également considérer la séquence d'éruption : les canines supérieures suivent d'environ un an les secondes prémolaires (séquence la plus commune : 4-5-3) ou les premières prémolaires (séquence 4-3-5).

On devrait donc sérieusement considérer la possibilité d'une canine incluse lorsqu'on observe un ou plusieurs des signes suivants :

- absence de protubérance vestibulaire à 10 ou 11 ans
- canine n'ayant pas fait éruption en bouche à 13,5-14 ans ou ne suivant pas la séquence d'environ un an
- rétention prolongée de la primaire

- bascule distale ou proclinaison de l'incisive latérale
- résorption radiculaire (mobilité excessive) de l'incisive latérale
- déviation de la ligne médiane (se fera du côté de la dent incluse).

Avant d'intervenir, il est important de bien situer la dent. Est-elle palatine ou labiale? Deux radiographies, avec des angulations différentes, peuvent nous permettre, selon la règle de Clark, de répondre à cette question.

Il existe plusieurs protocoles radiologiques pour localiser avec précision une canine incluse :

- céphalogramme latéral
- occlusal vertex et périapical
- occlusal oblique et périapical
- panoramique, occlusal vertex et périapical
- tomographie axiale.

À la suite du diagnostic d'une canine maxillaire incluse, le patient en est informé de même que les parents. La question est immédiate : qu'arriverait-il si on la laissait là? Les complications suivantes peuvent déjà être associées à une canine incluse ou peuvent survenir si on n'intervient pas :

- rhizolyse des dents adjacentes, pouvant même atteindre la pulpe et mortifier la dent (surtout la latérale)
- infection des dents adjacentes
- kyste péricoronaire
- complications neurologiques (douleur)
- problèmes périodontaires (inflammation gingivale, défaut osseux).

La canine est une des dents les plus importantes de la denture permanente. Au niveau esthétique, sa forme assure la transition entre les antérieures et les postérieures. Également, la bosse canine est importante dans la forme du visage et pour l'insertion des muscles de l'expression faciale. Sa racine est très longue (en fait c'est la plus longue); ceci permet de stabiliser l'arcade. Enfin, au niveau fonctionnel, la canine permet la guidance, qu'on ait une disclusion par la canine ou même une fonction de groupe. Le remplacement de la canine par un pontique ne peut donc pas remplacer à certains égards la vraie dent.

Traitement

Le traitement de la condition peut être l'abstention pure et simple, l'extraction de la dent ou sa mise en place. Cette dernière solution, si les conditions le permettent, est la meilleure.

A. L'abstention

Le statu-quo est indiqué dans trois situations :

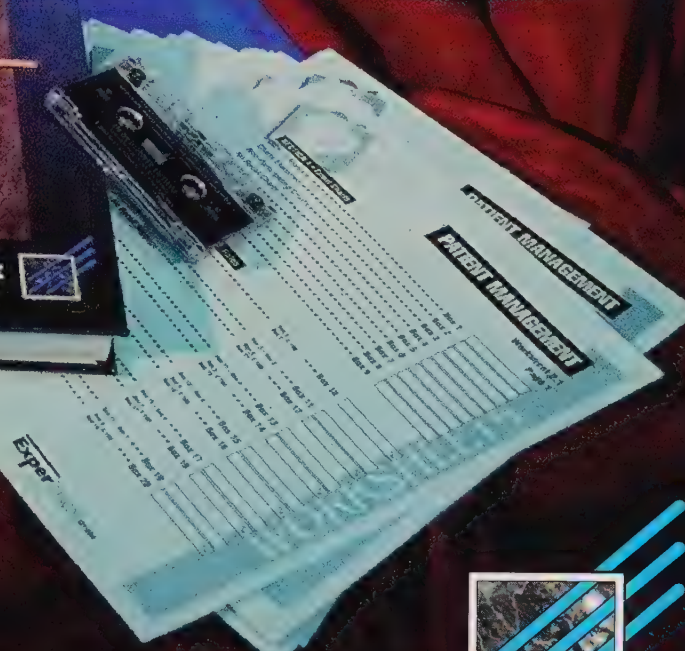
- 1) Il peut arriver qu'une approche chirurgicale pour exposer la canine incluse et qu'un traitement subséquent d'orthodontie, pour la mettre en place, soient impossibles. Entre autres, ce peut être le choix du patient, que ce soit pour des raisons personnelles ou économiques. Également, des contre-indications systémiques peuvent rendre imprévisible, voire même risquée, une telle intervention. Enfin, il faut savoir que l'exposition de la dent exige, dans certains cas, l'ablation d'une quantité relativement importante de tissu osseux et ce, à proximité des structures adjacentes. Dans certains cas, les risques de délabrement osseux ou dentaire sont trop grands pour intervenir, exposer la canine, en vue de la mettre en place.
- 2) Si la canine primaire est intacte, c'est-à-dire s'il n'y a pas eu de rhizolyse et que sa couronne est saine, sans obturation importante ou d'attrition marquée, on peut songer à la laisser en place. On pèse encore ici le pour et le contre car la mise en place d'une canine incluse, quoique souvent possible, demeure risquée; la dent peut être ankylosée, elle peut résorber sur son passage une dent adjacente et même la dévitaliser, elle peut créer des problèmes gingivaux et périodontaires et l'espace disponible pour sa mise en place peut ne pas être adéquat.
- 3) Si l'espace normalement réservé à la canine n'est plus disponible, sa mise en place s'en trouve compliquée du fait qu'on doit préalablement rouvrir l'espace; ce qui, dans certains cas, en particulier quand le segment postérieur a avancé, peut être difficile et onéreux.



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Dans les cas où on choisit de laisser la canine en place et de ne pas intervenir, il faut bien renseigner le patient sur les risques de ne pas traiter. De plus, la situation demande à être réévaluée périodiquement.

B. L'extraction

Cette solution peut être indiquée si le patient demande que le problème soit réglé rapidement, sans orthodontie. Dans ce cas, l'approche prothétique permet de traiter en un minimum de temps.

C. La mise en place

Tout d'abord, lorsque la décision d'exposer et de mettre en place la canine permanente est prise, on doit toujours considérer qu'il est possible à tout moment, lors du traitement, de ne pas obtenir le résultat voulu. En conséquence, il sera sage d'extraire le plus tard possible la canine primaire si elle est intacte. Bien sûr, si la rhizalyse de la racine est déjà passablement avancée, si la dent est infectée ou si de toute façon son pronostic est pauvre à long terme, on l'extraîra, ce qui laissera un chemin pour le trajet de la permanente et facilitera l'application de la mécano-thérapie.

Pour les mêmes raisons, s'il est prévu au plan de traitement d'extraire une prémolaire dans le même quadrant (pour corriger simultanément une classe II par exemple), il est recommandé d'attendre que la canine soit bien en route avant de le faire. S'il advenait que la canine ne puisse pas être mise en place, la perte supplémentaire de la prémolaire adjacente serait catastrophique.

Deux approches chirurgicales peuvent être envisagées : une exposition chirurgicale sans traction ou avec traction orthodontique active.

Lors d'une approche chirurgicale sans traction, un lambeau mucopériosté est relevé, la couronne de la canine est dégagée de l'os et, lors de la fermeture, selon les cas, le lambeau peut être fenêtré à l'endroit prévu pour l'émergence de la dent. Cette approche est recommandée dans les cas où on juge qu'il y a un potentiel intrinsèque d'éruption, notamment si le che-

Ressort pour favoriser l'éruption de la canine supérieure droite

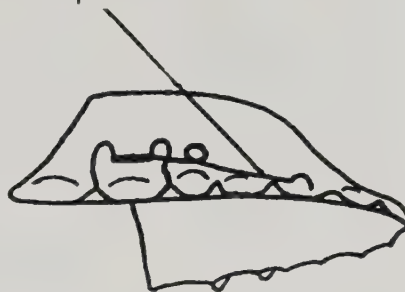


Fig. 1 : Plaque de Hawley (vue latérale droite)

min à parcourir est court, si l'axe de la dent est favorable et si la racine n'est pas complétée. Cette méthode peut permettre la première phase de l'éruption; l'éruption subséquente et l'alignement final peuvent nécessiter une phase orthodontique.

La traction orthodontique active exige également l'élévation d'un lambeau mucopériosté et l'ablation d'os autour de la couronne. Diverses techniques de traction ont pu être utilisées et ne sont citées ici qu'à titre "historique" : ligature en lasso autour du collet, capuchon en or cimenté (obtenu à partir d'une empreinte), tenon vissé dans la couronne au talon, ligature passée dans une perforation du bout incisif.

La technique utilisée maintenant consiste à cimenter un bouton orthodontique à l'aide d'une résine composite auto-polymérisante (Phase II). La couronne de la dent est isolée du reste du champ opératoire avec une gaze 2x2. Elle est mordancée, rincée à l'eau puis asséchée. Une résine liquide auto-polymérisante est ensuite appliquée sur la dent et sur l'intrados du bouton, puis la cimentation est complétée avec la résine composite de cimentation. La polymérisation étant complétée, la solidité du lien est testée.

Une ligature métallique (double brin de fil d'acier inoxydable 0,028 po.) est ensuite torsadée autour du bouton, ce qui produit un fil de traction flexible formé de quatre brins. L'ajustement de la ligature au bouton doit être suffisamment serrée pour y rester accrochée tout en permettant une rotation autour du bouton. Le lambeau est refermé et la ligature émerge sur la crête à l'endroit où on veut amener la canine.

Deux types d'appareillage pour faire la traction peuvent être utilisés : l'amovible et le fixe. L'appareil amovible (Fig. 1) est à la base une plaque de "Hawley" à laquelle est fixé un ressort dont l'extrémité active se trouve au futur site de la canine.

Avantages :

- bénéficie du support du palais et minimise de ce fait les mouvements dentaires
- les dents adjacentes sont libres de se déplacer, ce qui limite la résorption en cas de contact accidentel pendant le trajet
- sert de plaque chirurgicale.

Désavantage :

- pas de mouvement de racine possible pour l'ajustement de la position finale.

Quant à la mécano-thérapie de type fixe, elle présente les caractéristiques suivantes :

Avantages :

- permet de corriger simultanément d'autres problèmes souvent présents dans de tels cas;
- permet d'agir sur tous les plans de l'espace et ainsi obtenir la position idéale de la canine.

Désavantage :

- ancrage seulement sur les dents.

Que ce soit par la technique fixe ou amovible, on doit appliquer une faible force de traction, soit environ 20 g.

Enfin, il est important que la dent fasse éruption à travers la gencive attachée. Au buccal, pour éviter que la dent fasse éruption à travers la muqueuse, le lambeau doit être replacé apicalement (L.R.A.). Au palatin, il n'y a pas de problème, le lambeau est replacé



au même endroit et, même si la muqueuse y est épaisse, l'éruption n'est pas entravée.

Si la dent devient ankylosée, le mouvement de traction cesse, les dents d'ancrage pouvant même se mettre à bouger. Si la zone d'ankylose semble limitée, on pourra tenter de luxer la dent et de continuer la traction lors d'une nouvelle procédure chirurgicale.

Étude clinique portant sur 96 dents incluses

Nous avons retenu un certain nombre de paramètres que nous avons compilés après la lecture de 79 dossiers sélectionnés du Département de chirurgie de la Faculté de médecine dentaire de l'Université Laval pour la période se situant entre 1978 et 1992. Nous n'avons retenu que les dents incluses se rapportant aux dents antérieures ainsi qu'aux prémolaires, les molaires étant exclues de l'étude.

Le questionnaire contenait les informations suivantes :

- identification du patient ainsi que son âge à la date de la chirurgie
- le numéro de la ou des dents incluses
- les positions transversale et frontale de l'incluse
- la position de la couronne de l'incluse par rapport aux racines des latérale et centrale adjacentes
- la présence de follicule hypertrophié (trois millimètres et plus de la couronne)
- rétention de la canine primaire ou non
- déplacement des latérale et/ou centrale par l'incluse
- l'approche chirurgicale employée pour exposer l'incluse pour traction orthodontique
- le moyen utilisé pour attacher l'incluse à l'appareil de traction orthodontique
- le suivi orthodontique incluant le nombre de visites pour extraire l'incluse, les problèmes rencontrés, positionnement réussi ou non, perte de la dent ou non au cours ou à la fin du traitement et, finalement, la durée du traitement en année(s) à partir de la date de la chir-

gie jusqu'à la rétention de l'incluse à la position finale obtenue.

Nous n'avons retenu que les dossiers nous permettant de faire ressortir les différents éléments de la phase chirurgicale et orthodontique car il y avait plusieurs dossiers qui ne comportaient que la phase chirurgicale faite à la Faculté de médecine dentaire, le suivi orthodontique se faisant en cabinet privé. Pour cette raison, il s'avère que, pour une vingtaine de dossiers, nous ne pouvons pas confirmer la réussite ou l'échec du positionnement final de l'incluse. De plus, pour ces mêmes dossiers, souvent seuls un panogramme et le protocole chirurgical étaient consignés au dossier, ne nous permettant pas de répondre à tous les points de la partie chirurgicale du questionnaire.

Résultats de l'étude

Les points essentiels qui sont ressortis de l'étude sont les suivants :

Sur les 79 dossiers retenus :

Données générales :

- 51 femmes, soit 65 p. cent
- 28 hommes, soit 35 p. cent
- un ratio femme-homme de 2-1
- l'âge moyen au moment de la chirurgie se situait à 17,53 ans chez les femmes et à 16,52 ans chez les hommes, la plus jeune patiente ayant 11,62 ans, la plus jeune patiente la plus âgée avait 32,42 ans et le patient le plus âgé avait 30,47 ans
- un seul homme avait plus d'une dent incluse en bouche alors que 13 femmes avaient plus d'une dent incluse, allant même jusqu'à 4 dents incluses.

Siège de la dent incluse :

- 96 dents incluses ont été opérées de façon chirurgicale
- 88 étaient des canines (92 p. cent)
 - dont 46 supérieures droite (#13) (48 p. cent)
 - 39 supérieures gauche (#23) (41 p. cent)
 - 2 inférieures droite (#33) (2 p. cent)
 - 1 inférieure gauche (#43) (1 p. cent)
- 4 étaient des prémolaires

- dont 1 première inférieure gauche (#34) (1 p. cent)
- 1 deuxième supérieure droite (#15) (1 p. cent)
- 1 deuxième supérieure gauche (#25) (1 p. cent)
- 1 deuxième inférieure gauche (#35) (1 p. cent)
- 4 étaient des incisives
 - dont 3 centrales supérieures droite (#11) (3 p. cent)
 - 1 centrale supérieure gauche (#21) (1 p. cent)

Étant donné le faible nombre de dents incluses inférieures, nous allons restreindre la suite des détails statistiques aux 85 canines incluses supérieures.

Les pourcentages manquants sont des données inconnues non mentionnées aux dossiers ou, encore, des cas où le suivi a été assuré à l'extérieur de la Faculté.

Position de la canine incluse :

- position transversale
 - 60 en position palatine (71 p. cent)
 - 7 en position buccale (8 p. cent)
 - 13 en position mi-chemin buccal et palatin (15 p. cent)
- position frontale
 - 58 en position mésio-an-gulée (68 p. cent)
 - 13 en position verticale (15 p. cent)
 - 4 en position horizontale (5 p. cent)
- position de la couronne de l'incluse
 - 38 par rapport à la latérale (45 p. cent)
 - 1 par rapport à la centrale (1 p. cent)
 - 26 par rapport aux deux (30 p. cent)

Présence d'un follicule hypertrophié :

- 5 présents (6 p. cent)
- 73 absents (86 p. cent)

Rétention de la canine primaire :

- 47 oui (55 p. cent)
- 32 non (38 p. cent)

Déplacement des latérales-centrales par l'incluse :

- 8 oui (9 p. cent)
- 17 non (20 p. cent)

Approche chirurgicale :

- 35 palatines (41 p. cent)

- 18 buccales (21 p. cent)
- 28 palatines et buccales (33 p. cent)

Appareil de traction orthodontique :

- 33 braquettées (39 p. cent)
- 34 trous coronaires (40 p. cent)
- 13 ligatures au collet (15 p. cent)
- 5 sans traction (exodontie lors de l'exposition) (6 p. cent)

Suivi en orthodontie à la Faculté de médecine dentaire de l'Université Laval :

- 62 oui (73 p. cent)
- 23 non (exo, pas d'information, en privé) (27 p. cent)

Nombre de visites en orthodontie et durée moyenne :

- 16 visites en moyenne, sur une période moyenne de 2,39 ans
- 5 le plus petit nombre de visites, sur une période de 0,47 an
- 39 le plus grand nombre de visites, sur une période de 6,24 ans

Positionnement réussi :

- 48 oui (56 p. cent)
- 15 non (18 p. cent)
- 22 données inconnues (26 p. cent) (cas en cabinet privé)

Positionnement non réussi et perte de la dent :

- 13 cas (15 p. cent)

Positionnement non réussi et pas de perte de la dent :

- 2 cas (2 p. cent)

Pour les 15 cas d'échec du positionnement de la dent, les principales raisons sont :

- 5 cas (manque de coopération, de motivation) (33 p. cent)
- 4 cas (ankylose) (27 p. cent)
- 2 cas (traitement inefficace) (13 p. cent)
- 1 cas (proximité radiculaire de la latérale) (7 p. cent)
- 1 cas (résorption externe) (dommage iatrogénique) (7 p. cent)
- 2 cas (sans explication) (13 p. cent)

Conclusion

L'inclusion de canines est beaucoup plus fréquente au maxillaire supérieur (97 p. cent) qu'au maxillaire inférieur (3 p. cent). Les autres dents incluses (excluant les molaires) ne regroupent qu'un faible pourcentage du total (8 p. cent). Ceci est en corrélation avec une étude de Fleury et coll. (1986) qui dénombrerait des résultats similaires

sur les canines incluses, soit 89 p. cent de canines supérieures et 11 p. cent de canines inférieures, sur dépouillement de 212 dossiers. La répartition des canines est plus évidente au maxillaire supérieur, compte tenu du nombre élevé. Notre étude démontre cependant un rapport 46:39 au maxillaire droit.

L'inclusion des canines semble un phénomène beaucoup plus fréquent chez la femme. Le ratio femme-homme (65 p. cent-35 p. cent) est d'environ 2-1, alors que dans l'étude de Fleury et coll. (1985), on obtenait femme-homme (57 p. cent-43 p. cent), soit un ratio d'environ 1,3-1.

La position des canines incluses supérieures est majoritairement sur le plan transverse au palatin (71 p. cent) et sur le plan frontal en position mésioangulée (68 p. cent). La couronne de la canine incluse est souvent, sur les radiographies, en rapport étroit avec la racine de la latérale adjacente (45 p. cent).

Il y a peu de canines incluses présentant un follicule hypertrophié (6 p. cent) et ceci ne pourrait expliquer l'inclusion de la dent. Dans

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55 p. cent des canines supérieures, il y avait rétention de la canine primaire, d'où l'importance de laisser en place cette dernière lors de la procédure chirurgicale de ligature, et ceci afin de permettre la conservation d'une dent en place advenant l'échec de l'extrusion de la dent incluse.

L'approche chirurgicale est plus fréquente par le palatin (41 p. cent) comparativement au buccal (21 p. cent), mais une forte proportion des chirurgies exigent une approche palatine et buccale mixte (33 p. cent).

Le type d'appareil de traction se partage entre l'utilisation de braquettes cimentées par composite (39 p. cent) et les trous coronaaires (40 p. cent) mais ces techniques se distinguent par la période où elles ont été utilisées. On note que, depuis les cinq dernières années, la technique de braquettes cimentées par composite est privilégiée lorsque les conditions idéales d'isolation du champ opératoire sont possibles. Sinon il est préférable de ligaturer l'incluse au collet avec un fil d'orthodontie, afin d'éviter une des-

truction de l'émail de la couronne ou encore une atteinte de la vitalité de la dent par exposition accidentelle de la pulpe lors de la perforation du trou coronaire.

À la Faculté de médecine dentaire, le suivi en orthodontie a été fait pour 62 cas de canines incluses supérieures alors que 23 canines ont été soit extraites lors de la chirurgie, soit traitées en cabinet privé; ou, tout simplement, cette information n'était pas disponible au dossier. Le nombre de visites était en moyenne de 16 sur une période moyenne de 2,39 ans. Le plus petit nombre de visites a été de 5 sur une période de 0,47 an et le plus grand nombre a été de 39 sur une période de 6,24 ans avec réussite du positionnement de la dent.

Pour les 15 canines non positionnées, les raisons de cet échec sont : un manque de coopération ou de motivation de la part du patient (33 p. cent), l'ankylose de l'incluse (27 p. cent), un traitement d'orthodontie inefficace (13 p. cent), l'obligation d'extraire la canine lors de la ligature parce qu'elle était trop proche de la racine de la latérale adjacente et

compromettait la survie de cette dernière. Un cas de dommage iatrogénique causant la résorption externe de la racine a été noté au dossier et il y a quelques cas sans explication (13 p. cent).

Ces résultats révèlent que le remplacement chirurgico-orthodontique de dents incluses au maxillaire supérieur, principalement s'il s'agit d'une canine, doit être considéré dans le plan de traitement suggéré au patient, avant d'aboutir à l'extraction sans condition. Le patient doit être bien informé des procédures chirurgicales et des soins qu'il devra suivre en orthodontie pour arriver à des résultats qui ne sont aucunement garantis. Le généraliste doit être vigilant sur la sélection des cas et, au besoin, il serait prudent qu'il consulte les spécialistes indiqués. ■

Cette recherche clinique a été possible grâce à une subvention du Fonds du doyen.

Les traitements orthodontiques ont été faits sous la direction des D^{rs} Christian Bernard et André Fournier, orthodontistes, Faculté de médecine dentaire.

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Le D^r Jean-Yves Turcotte est professeur en chirurgie buccale et maxillo-faciale à la faculté de médecine dentaire de l'Université Laval.

Le D^r Guy Maranda est professeur en chirurgie buccale et maxillo-faciale à la faculté de médecine dentaire de l'Université Laval.

Le D^r Richard Breton est en pratique privée à Québec.

Le D^r Louis Haché est en pratique privée à Québec.

Le D^r Jacques Houde est en pratique privée à Québec.

Demandes de tirés à part : D^r Jean-Yves Turcotte, Faculté de médecine dentaire, Université Laval, Cité universitaire, Ste-Foy, Qué. G1K 7P4

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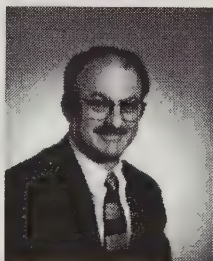
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INTERNATIONAL



November 15-17

Annual Congress of the Swedish Dental Society in Stockholm, Sweden. Contact Charlotte Nackstad, Swedish Dental Society, Box 5843, S-102 48 Stockholm, Sweden. Tel: (8) 666 15 00, or fax: (8) 662 58 42.

January 19-23, 1996

18th Asian Pacific Dental Congress & 50th Indian Dental Conference in Bombay, India. Contact Dr. Ashok Dhoble, Organizing Secretary, 18th A.P.P.D. & 50th I.D.C., 534 Bombay Mutual Terrace, 2nd Floor, Sandhurst Brige Opera House, Bombay 400 007 India. Tel.: 91-22-361 0248, or fax: 91-22-367 2627.

February 3-10

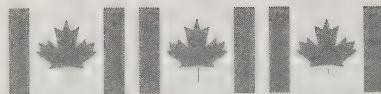
36th International Alpine Dental Conference in Courchevel, France. Lecturers: Dr. Lou Rossman, Prof.

Ivar Mjör and Fr. Martin Ritzau. Contact the International Dental Foundation, 53 Sloane St., London SW1X 9SW, U.K. Tel.: 00 44 (0) 171 235-0788, or fax: 00 44 (0) 171 235-0767.

March 23-30

37th International Alpine Dental Conference in Courchevel, France. Lecturers: Dr. Oded Bahat and Prof. Birte Melson. Contact the International Dental Foundation, 53 Sloane St., London SW1X 9SW, U.K. Tel.: 00 44 (0) 171 235-0788, or fax: 00 44 (0) 171 235-0767.

CANADA



November 2-4

University of Manitoba — Introductory Acupuncture For Dentists. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

November 3-4

How to do Selective Orthodontics in the General Practice — Modules 3 and 4. Co-sponsored by Space Maintainers Laboratories and Dalhousie University. Presenter: Dr. Walter Pfitzinger. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 4

Infection Control. Presenters: Heather Bowers, RDA and Cathy MacLean, BN. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 4

Oral Pathology and Panoramic Radiology. Contact the University of Western Ontario, Faculty of Dentistry, Room 1003, Dental Sciences Building, London, Ont. N6A 5C1. Tel.: (519) 661-3902, or fax (519) 661-3875.

November 18

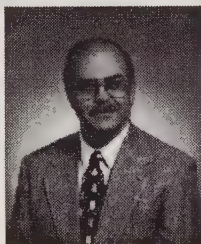
Rationale for Antibiotics in Periodontics. Presenters: Dr. Dan Price, Dr. Crawford Bain, Dr. Gary Foshay and Dr. Terrie Logue. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

November 18

University of Manitoba — Are Implants For Your Practice? Presenter: W. Brock Love, DMD, M.Sc. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

November 18

University of Manitoba — A Dental Hygienist's Perspective On The Monitoring And Maintenance Of Dental Implants. Presenter: Janice Wood, Dip. D.H. Contact Darcy



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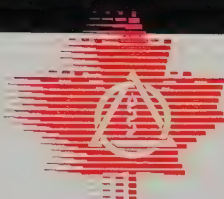
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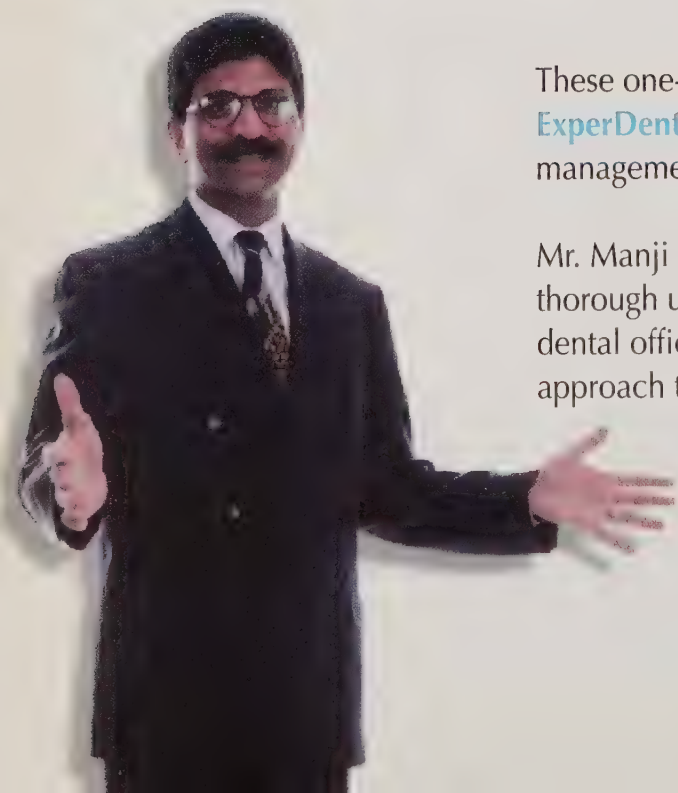
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Surviving and Thriving	Saskatoon	May 12
Reaching Out	Vancouver	June 9*
Surviving and Thriving	London	June 23
The Bottom Line	Victoria	October 13
The Bottom Line	Toronto	November 10
Reaching Out	Halifax	November 17
The Bottom Line	Fredericton	November 18
The Bottom Line	Ottawa	December 1
Reaching Out	Calgary	January 19, 1996
The Bottom Line	Edmonton	January 20
Reaching Out	Sudbury	January 26
Reaching Out	Windsor	February 2
Reaching Out	Toronto	February 9
Reaching Out	Montreal	February 16**
The Bottom Line	Saskatoon	March 1
The Bottom Line	Winnipeg	March 29

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November 30 - December 2

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December 2

Bonded Restorations: How to Make an Informed Choice in Selecting Materials and Techniques. Presenter: Dr. A. John Gwinnett. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

December 2

University of Manitoba — The Alpha Omega Memorial Lecture: Oral Manifestations Of Infection Disease with Sol Silverman Jr., DDS, MA. Contact Darcy Duggan (204) 789-3331, or fax: (204) 888-4113.

January 12-13, 1996

1- Assessment and Management of Medical and Dental Emergencies, 2- Oral Surgery Solutions to Help the Clinician Solve Common Clinical Problems for the Dental Patient. Presenters: Dr. Archie Morrison and Dr. Reginald Goodday. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

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November 16-18

Annual Meeting of the Academy of Dental Materials in San Diego,

California. Contact the Academy of Dental Materials, c/o ARDEL Management, Inc., 6518 Walker St., Suite 150, Minneapolis, Minn. 55426-4244. Tel.: (612) 927-6707, or fax: (612) 927-8127.

November 27-28

American Board of Oral and Maxillofacial Radiology 1995 — Certifying Examination. Applications must be submitted by May 15, 1995. Contact Dr. Curtis Lundeen, School of Dentistry — Oral Radiology, Oregon Health Sciences University, 611 S.W. Campus Dr., Portland, Ore. 97201-3097. Tel: (503) 494-8930.

December 25 - January 1

Alpha Omega International Dental Fraternity — Annual Convention in Tarpon Springs, Florida. Contact Stephanie Block, executive director, 206-1314 Bedford Ave., Baltimore, Md., 21208. Tel.: (410) 602-3300, or 1-800-677-8468.

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DENTAL MEETINGS



January 18-20

Annual Meeting of the Manitoba Dental Association in Winnipeg, Manitoba. Contact Mr. Ross McIntyre. Tel.: (204) 453-0055.

March 14-16

British Columbia Dental Meeting in Vancouver, B.C. Contact Marilynne Webster. Tel.: (604) 736-3645.

March 29-30

Interim Meeting of the CDA Board of Governors in Ottawa, Ont. Contact Suzanne Burton. Tel.: 1-800-267-6354.

May 2-4

Ontario Dental Association Annual Spring Meeting in Toronto, Ont. Tel.: (416) 922-3900.

May 9-11

Newfoundland Dental Association Annual Meeting in Cornerbrook, Nfld. Tel.: (709) 579-2362.

May 25-29

25^e Congrès annuel de l'Ordre des dentistes du Québec — Les Journées dentaires in Montreal, Que. Contact Nicole Pagé or Ginette Boutin. Tel.: (514) 875-8511 or fax: (514) 875-1561.

May 31-June 1

New Brunswick Dental Society Annual Meeting in St. Andrews, New Brunswick. Tel.: (506) 452-8578.

June 6-9

Alberta Dental Association Annual Meeting and Convention in Kananaskis, Alberta. Tel.: (403) 432-1012.

June 14, 15

Nova Scotia Dental Association Annual Meeting in Baddeck, Nova Scotia. Contact Mr. Steve Jennex. Tel.: (902) 420-0088.

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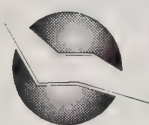
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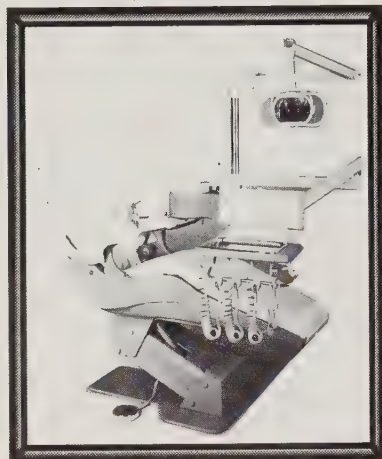
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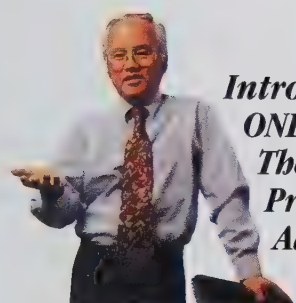
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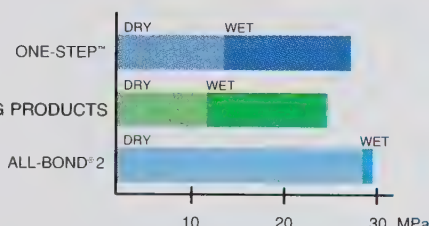
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* US Patent #5,348,988 † US Patent #5,385,728 ‡ moist does not mean saliva or blood contaminated
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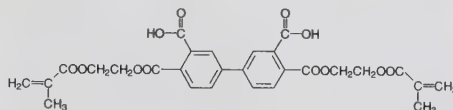
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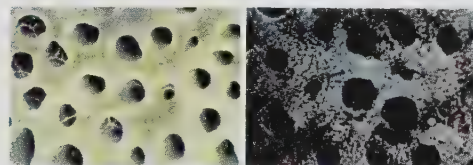


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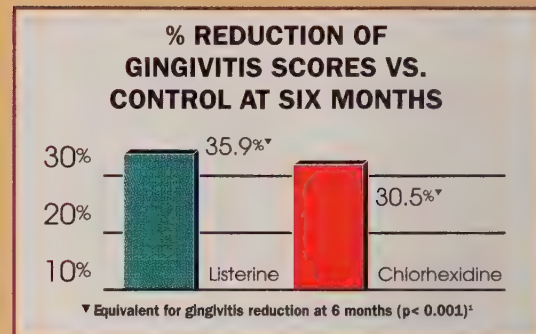
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¹ Overholser CD et al. Comparative effects of two chemotherapeutic mouthrinses on the development of supragingival dental plaque and gingivitis. J Clin Periodontol 1990;17:575-579.

² Data on file, 1995.

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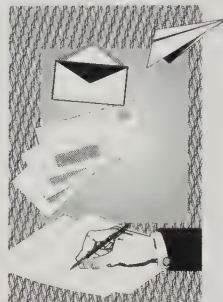
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LETTERS



Toluidine Blue

I have a number of concerns regarding two of the articles published in the September 1995 issue of the *CDA Journal*, both of which make reference to toluidine blue (CAOP Releases Toluidine Blue Statement, "News Update," 61:752, 1995 and; Leong, I.T., Main, J.H.P. and Birt, B.D. Cancer of the Tongue. 61:792-796, 1995.).

Having performed the original controlled prospective research studies on toluidine blue as a cancer diagnostic, I feel it is incumbent on me to correct some of the misconceptions and inaccuracies that I encountered in these papers, and to attempt to alleviate the authors' concerns by clarifying the diagnostic benefit to be gained from the use of toluidine blue as a diagnostic adjunct to a cancer examination of the oral and oropharyngeal mucosa.

I have devoted the last 30 years to conducting controlled prospective research studies¹⁻⁴ on the clinical behavior and characteristics of early asymptomatic oral/oropharyngeal and upper aerodigestive squamous carcinoma. These studies were motivated by the realization that early recognition of these cancers, in the asymptomatic, non-palpable, curable Stage I, had not been forthcoming, with the unfortunate result that five-year survival rates had not improved to any great degree. For survivors of later stage symptomatic lesions, esthetics and function are greatly compromised after surgery and/or radiotherapy.

Our studies demonstrated conclusively that the earliest visual sign of oral/oropharyngeal squamous carcinoma — not precancer — was a persistent erythroplastic (red in-

flammatory) lesion, with or without a white component, and with no apparent etiology, occurring in the floor of the mouth, soft palate complex and lateroventral tongue areas, which we have identified as high risk sites.⁵ Our findings were published widely and accepted by the head and neck oncology and pathology community.

Statistics on early diagnosis did not improve. It was apparent that although clinicians with diagnostic acumen could recognize the early asymptomatic carcinoma based on subtle erythroplastic changes, those inexperienced in this area or unaware of the appearance of these mucosal alterations were at a distinct disadvantage.

As a result, in 1976 the National Institute of Health (NIDR) prevailed on me to re-evaluate toluidine blue as a diagnostic adjunct to a cancer examination. Previous studies⁶⁻⁹ had established it as a useful agent for identifying malignant changes of the oral mucosa. However, concern was expressed¹⁰ that although few false negatives had been reported, its use had been discouraged until additional information on false positives had been gathered. In our subsequent controlled studies, with both the application (for observed lesions regardless of suspicion) and the rinse^{12,13} that we developed (to detect unobserved cancers in patients at high risk), we found that waiting 10-14 days after a positive stain to allow non-malignant inflammatory lesions to subside and then restaining reduced false positives to a seven to nine per cent range. This alleviated the previous concerns expressed by cancer control colleagues. False negatives had never been a problem. Our studies supported the previous reports that false negatives were minimal, in the range of two to six per cent. Considering that the rinse was to be used as a screening modality for lesions that were unapparent in the clinical examination, these findings were quite significant. Additionally, we must consider that there is no appreciable data in the literature indicating clinical false negatives other than the statistics that the greater number of cancers, when diagnosed, are symptomatic and well advanced. This clearly suggests an

unacceptably high false negative rate for clinical recognition of early lesions. We established a sensitivity and specificity of over 90 per cent.

The use of toluidine blue is not suggested as an alternative to biopsy, nor does it have utility in identifying so-called precancers — few of which progress to invasive carcinoma. Its purpose is to identify carcinoma *in-situ* and the earliest of invasive carcinoma. It is to be used as a diagnostic adjunct to a cancer examination. The application is used for observed lesions, primarily when the lesion is not suspect, and to determine the appropriate biopsy site in suspect lesions. It is stressed that clinical suspicion mandates biopsy even in the presence of a negative stain.

The rinse modality is employed to identify clinically unapparent primary cancers of the oral cavity/oropharynx in patients at high risk, i.e. smokers and drinkers or those who have had a previous or concurrent oral/oropharyngeal and other upper aerodigestive tract (pharynx, larynx, esophagus) and lung. It has been established in numerous epidemiologic studies that these patients at high risk have synchronous or metachronous multiple primaries of the aforementioned sites. I should note that many of our head and neck surgery colleagues are using toluidine blue to identify unapparent cancers of the pharynx and larynx, and as an aid to biopsy during laryngoscopy.

I applaud the CAOP and Dr. Leong et al for stressing early recognition. I suggest, however, that they consider reviewing the literature and revise their recommendations to encourage the use of toluidine blue by the dental practitioner. This diagnostic will aid in the early diagnosis of asymptomatic cancers that escape recognition, resulting in increased survival as opposed to the present state of poor survival for patients with this most disfiguring and lethal cancer.

Arthur Mashberg, DDS
Clinical Professor of Surgery
New Jersey Medical School
Newark, N.J., U.S.A.

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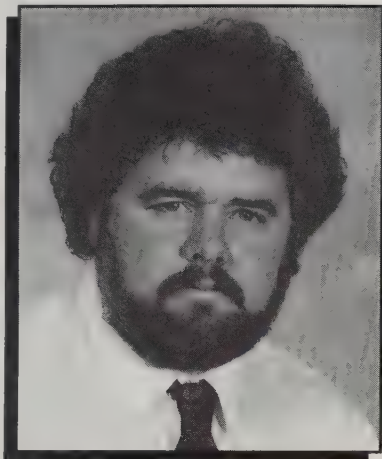
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GUEST EDITORIAL

ORAL AND MAXILLOFACIAL RADIOLOGY: STRIVING FOR ADEQUACY?



Dr. R.E. Wood

As a practising maxillofacial radiologist, I regularly review dental journals for information on new techniques, diagnostic methods and the diagnostic aspects of pathoses. Prior to the recent discovery of a periapical lesion on one of my own teeth, which reared its ugly head in the form of a toothache on an adjacent tooth, I had largely sworn off routine dental radiographs as being "biologically costly."

My lesion had probably been present for many years. With its discovery, I became both diagnostician and "diagnosed," and I've had some cause to reconsider my position on the use of dental X-rays.

One hundred years after the discovery of X-rays, I am disappointed to see that a large chunk of the oral and maxillofacial radiology literature is devoted to describing how dangerous X-radiation is. Much less time and effort is devoted to noting how radiography can be used to benefit the patient.

This is worrisome. In all other areas of dental care, considerable time and talent is expended developing new and better procedures and techniques to improve the dental health and well-being of the dental patient. Non-radiologic journals are replete with dissertations on new surgical techniques, refinements in dental

materials and prosthetic procedures, and improvements in the biological knowledge of oral and dental diseases. Yet radiology journals tend to focus to a greater extent on how many patients we may be inadvertently killing than on how many could benefit from a radiologic examination. Special emphasis is placed on denigrating the radiologic image to the point of making it just slightly better than useless.

When a restorative treatment is undertaken, we assume that the result should be of optimum quality — not just adequate. When I examine a radiographic image, I also want it to be of the highest quality.

Most estimates of the risk posed by dental radiology are based on an interpolation of data obtained using higher doses. While there is no universally-held estimate of risk for a given dental radiographic procedure, it is generally accepted that each radiologic examination carries with it a risk of induction of malignancy.

Unfortunately, we cannot ethically or mathematically undertake an effective study to determine exactly how many or which patients may be harmed by dental radiation. This would require one enormous group of patients to receive only dental radiographs, while another enormous group, the control population, received no radiation, so that we could locate and quantify those subjects in whom malignancy was induced. Nevertheless, the radiologic community has gone to great lengths to estimate this risk.

The converse is less true. Dentists and radiologists have not, to any great degree, attempted to quantify the benefits of radiology to patients. I can identify at least one "diagnosed" patient who recently benefited from radiological examination (me), and, like all of us, have treated numerous patients who have been spared needless suffering as a direct result of an accurate, high-quality, well-directed radiologic examination.

Imagine for a moment practising dentistry without radiographs. Every specialty and each aspect of dental practice would be made more difficult without the ability to see beneath the surface, into our patients' teeth, bone and tissues. Now imagine a world in which other aspects of dental practice were subjected to the same risk-benefit analysis as radiography. During surgery or periodontal treatment, do our patients worry about the risk involved? Do they even realize that it may induce endocarditis? Do we really inform our patients about the mathematical risk of serious side effects occurring following the administration of local anesthetic or prescription drugs? Do we know these risks? Have we made any serious attempts to measure them?

Radiology, as a specialty, has gone to great lengths to estimate the risk associated with its procedures, while other dental specialties have not. As we move into the 21st century, many new applications of dental radiology will become commonplace in dental practice. I suspect that one day we will move toward a "filmless" practice, where images are stored electronically. Despite this, the best means of saving patients from unnecessary radiation is to expose radiographs only when it is anticipated that there will be a return on the "investment." The most "dosimetrically inert" imaging system still results in a greater dose of radiation than if the film was not taken in the first place. Many radiographic prescription regimens exist to guide the dental practitioner on the correct frequency of radiographic examinations. While these systems may be efficacious, the responsibility for the decision of when and how much to expose a patient to X-ray radiation must rest solely with the dental practitioner. We must educate our students in the proper use of radiography, re-educate ourselves through continuing education, and trust ourselves to use radiology in a responsible manner.

R.E. Wood, DDS, M.Sc., Dip. Oral Rad., FRCD(C)

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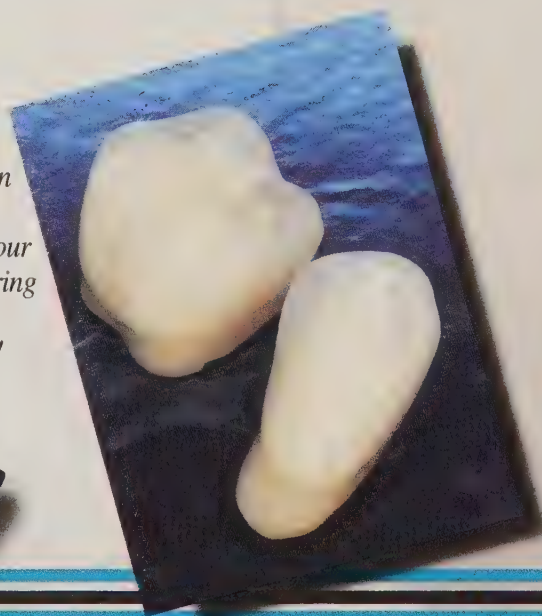
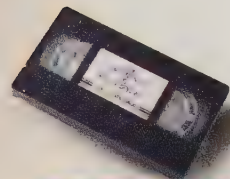
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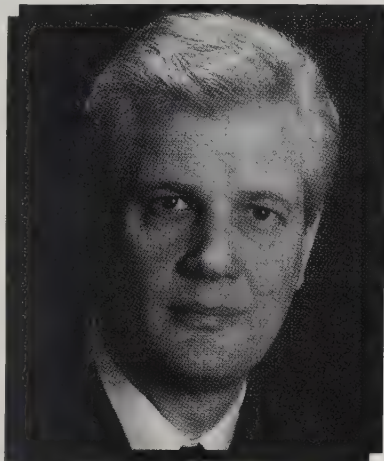
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PRESIDENT'S COLUMN

LET'S GIVE NEW DENTISTS A LARGER VOICE



Dr. Jim Brookfield,
CDA president.

In recent months, with three daughters at home and two at university, I've spent a lot of time contemplating what the future holds for my family.

Like it or not, when economic times are tough, it's usually our young people who pay the biggest price. Many find themselves unemployed or underemployed. Others put themselves through school only to find their dreams of a rewarding professional career become entangled in a seemingly unescapable web of high costs and low busyness.

Even dentistry has not escaped the jobless recovery unscathed. From what we've heard, there are new graduates in some parts of the country who are working just one or two days per week, and some have had to resort to alternative means of keeping bread on the table, even to driving a cab. Despite this, more and more young people are seeking out a career in dentistry, and those who can't find a space in a Canadian faculty are flocking to the United States.

This has created a dilemma for dental educators across the country as well as for our national dental examining board. The other dilemma of the day is more universal. With government at all levels implementing new deficit reduction strategies, Canada's 10 dental faculties are facing a

funding crisis. The word is out. Cut costs or else.

In Alberta, educators agreed to integrate the oral health sciences program into a restructured faculty of medicine and oral health sciences. The goal was to trim as much as \$3 million from the oral health sciences budget, and avert the closure of the dental faculty. Time will tell how effective this new structure is.

Surprisingly, despite the uncertainty surrounding dental education and the difficulties they face in making the transition from dental school to dental practice, new dentists in the voluntary provinces have been slow to join their national and provincial associations. Take Toronto's graduating class of 1991, for example. In a recent survey, less than half of the 39 respondents reported joining CDA during their first year of practise.

CDA has responded to the low membership numbers among new dentists in Quebec and Ontario by developing practice management programs geared toward this group, facilitating the payment of annual dues, and offering price breaks on everything from insurance coverage to sweaters. We've also made a point of having our president or a member of executive council speak to first-year students about the importance of belonging to their national association in once-a-year, welcome to the profession, speeches.

The intent was to show students the "bang for the buck" they would receive through membership in CDA, and to assure them that we would welcome their participation in organized dentistry. There's no question that we had a lot of positive things to say. From the success of the "Enough is Enough" campaign, to the development of our new MP Contact Program, CDA has done a lot on behalf of the dental profession in recent years.

But what we failed to do was to really give new dentists a voice in organized dentistry, and let them tell us what they wanted from their national association.

That changed September 24, when our ad hoc new dentists committee gathered in Ottawa to hold its inaugural meeting. From what I've

heard, it was a good session. There was a real sense of moving forward, and several good ideas were put on the table. What struck me, however, was the feeling among committee members that what new dentists want is a closer relationship with CDA. They want to bring their point of view to our various committees, a say in the type of programs and services we offer, and to be heard.

The committee's other message was that CDA should have a greater and more personal presence among young practitioners, beginning in their undergraduate years. They'd like the CDA spokesperson who welcome students to the dental profession to be individuals that young and aspiring dentists can relate to, and they'd like the contact that CDA makes with dental students to continue after they've entered practice.

It may be a tall order, but it's a message we cannot afford to ignore. While no one is saying we should do away with discounts and innovative payment options, they are clearly looking to CDA to forge a new relationship with recent graduates and become a visible part of their day-to-day practice lives.

The committee feels that new dentists in Quebec and Ontario would welcome greater cooperation between their national and provincial associations. Rather than seeing us compete with one another to provide programs and sell memberships, they'd like to see us reach agreement on a joint membership initiative. Clearly, this is a political issue that will only be resolved through continued discussion, but it puts a whole new perspective on the membership problem.

The new dentist committee will meet again in early January to put the finishing touches on a new, comprehensive survey to determine what types of programs and services new dentists want CDA to provide on their behalf, and what they want their national association to be.

I'm looking forward to hearing the results, and to welcoming new dentists into the fold of organized dentistry.

*James R. Brookfield, DDS
President of the Canadian Dental Association*

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NEWS UPDATE

B.C. "Save A Smile" Program Fills a Need

Now in its fifth year, B.C.'s Save A Smile program shows no signs of winding down.

Organized by the College of Dental Surgeons of British Columbia in conjunction with The Variety Club, the program was developed to provide treatment to underprivileged children with serious dental needs.

Despite the end of the recession, the number of needy school-age patients seeking dental treatment continues to be high. According to provincial statistics, 70 per cent of entry level school-aged children have no dental problems and 20 per cent require only one or two fillings. However, as many as three per cent of the remaining 10 per cent of children with unmet dental needs require immediate dental treatment.

"Essentially, we are trying to assist children with pain, abscesses, infection, or serious decay who, for reasons of financial hardship, have not received treatment," said Dr. Don Lauriente, director of professional resources for the B.C. College of Dental Surgeons.

Approximately 100 children in British Columbia will benefit from the Save A Smile program during the 1995 school year. Funding for the treatment provided by the program included more than \$18,000 in donations from the dental industry, the dental profession and corporate affiliates. Another \$20,000 was allocated to the program from the money that the college collected in disciplinary fines this year. ■

Toronto Hosts U.S. and Canadian O/M Surgeons Meeting

For five days last September, more than 3,800 oral and maxillofacial surgeons from across Canada and the United States held the first combined meeting of their respective associations in 25 years.

Members of the Canadian (CAOMS) and American (AAOMS) associations of oral and maxillofacial surgeons were joined in Toronto by Dr. Rudy Friese, president of the International Association of Oral and Maxillofacial Surgeons, and a strong international contingent representing over 25 countries.

The scientific program included 150 surgical and practice clinics, in



Dr. Samuel Kucey, President CAOMS

addition to major symposia. Joint forums highlighted issues affecting the emerging health care systems in Canada and the United States, notably the increasing control of private insurers in the U.S., and both federal and provincial governments in Canada, over access to dental care.

Two of the highlights of the meeting occurred when CAOMS presented Dr. Albert Antoni of London, Ontario, with a lifetime achievement award in oral and maxillofacial surgery, and Dr. Samuel Kucey of Ottawa was elected president of the association for the 1995-1996 term. ■

Health Canada Publishes Family Violence Handbook for the Dental Community

Health Canada has released its latest publication, *Family Violence Handbook for the Dental Community*, as a guide for all members of the dental team.

The handbook deals with how to address family violence issues in dental practice, the educational setting, the professional association, and the community at large.

Funded through the federal family violence initiative, the publication is the latest in a series of initiatives undertaken over the past three years to raise awareness of family violence among all health care professionals, and to help them recognize the impact of family violence on patient care.

The handbook is really a "how to" primer that explains how the dental professional should respond to family violence. In easy to read, step-by-step form, it addresses current awareness of family violence, its recognition, appropriate responses and actions, and the myths and facts about family violence, particularly as it affects children, women and the older adult.

Limited copies of the handbook are available by contacting either Publications, Health Canada, at (613) 954-5995 (fax (613) 941-5366); or the National Clearinghouse on Family Violence, at (613) 957-2938 (fax (613) 941-8930 or 1-800-267-1291).

Health Canada, with the support of CDA, has also released a 28-page bibliography on family violence. Called *Family Violence Resource Materials for the Dental Community: An Annotated Bibliography*, it lists and describes a series of articles on family abuse. The bibliography is divided into four areas of interest: child abuse, abuse of older adults, woman abuse, and family violence.

Copies of the bibliography, which was prepared for Health Canada by CDA's librarian, Martha Vaughan, are available free-of-charge to CDA members by calling 1-800-267-6354 or (613) 523-1770. ■

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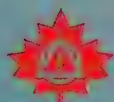
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CDA Celebrates 50th Anniversary

The Canadian Dental Assistants Association (CDA) is 50 years old.

CDA was formed June 20, 1945, in Winnipeg, as the Canadian Dental Nurses and Assistants' Association. Its founding meeting was attended by representatives from across Canada, and chaired by Dr. M.H. Garvin, then the editor of the *Journal of the Canadian Dental Association*.

Discussions on forming a national dental nurses' and assistants' association had taken place as far back as 1930. At the time, it was hoped that a national affiliation would benefit the smaller dental nurses' and assistants' associations across the country and do much to develop the role of the dental nurse within the dental practice.

The new organization had a long way to go. All told, with the \$50 in contributions that it received from across the country during its founding meeting, a personal gift from the Toronto representative, and a \$25 cheque from Dr. Garvin, CDA had a mere \$100 in its treasury when it began its national mandate.

The task of building CDA fell on the association's first executive team: president, Mrs. Marion Edwards, Toronto; vice-president, Miss Ruby Donald, Victoria; 2nd vice-president, Miss Hazel Wylie, Winnipeg; and secretary-treasurer, Mrs. Irene Bruce, Toronto.

Today CDA has a total membership of 2,700. The association maintains a national headquarters in Ottawa, where newly appointed Ms. Dawn Roach presides as executive director. After 50 years, CDA remains dedicated to serving the needs of dental assistants across Canada, and to providing a strong, united voice on such issues as educational standards, regulatory and legislative principles, and current public issues such as the taxation of dental benefits.

Education remains the cornerstone of CDA's existence, however. Through an extensive continuing education program and a national certification mandate, the organization encourages its members to maintain a continuous high level of professional standards. ■

Public Health Dentists Elect New President

Dr. Gordon Thompson of Edmonton has been elected president of the Canadian Association of Public Health Dentists for the 1995-96 term.

A former dean of the University of Alberta's dental faculty, Dr. Thompson is currently the executive-director of the Alberta Dental Association. He holds a masters degree in preventive dentistry as well as a doctorate in epidemiology and biostatistics from the University of Toronto.

During his tenure as a staff member and assistant/associate dean at the University of Toronto, and dean and department chairman at the University of Alberta, Dr. Thompson published more than 100 scientific papers and 75 abstracts in preventive dentistry, public health and epidemiology.

He will be joined on the executive of the Association of Public Health Dentists by: president-elect, Dr. Patricia Main of North York; past-president, Dr. Peter Cooney, Winnipeg, and secre-



Dr. Gordon Thompson

tary-treasurer, Dr. Ewan Swan of Ottawa.

The association recently initiated a restructuring plan. Once the required bylaw changes have been approved by the CDA board of governors and Industry Canada, the name of the organization will officially be changed to the Canadian Association of Public Health Dentistry. It is anticipated that this process will be completed in the fall of 1996. ■

Dr. Wayne Raborn Appointed Alberta Associate Dean

Dr. G. Wayne Raborn, former chairman of the division of oral diagnosis and oral medicine, has been appointed associate dean for dentistry at the University of Alberta.

Dr. Raborn will maintain his new position until April 1, 1996, when the 78-year-old faculty of dentistry will be reshaped as the department of oral health sciences and integrated into a new, expanded faculty of medicine. At that time he will assume the new positions of associate dean of medicine for oral health sciences and chair of the department of oral health sciences.

Dr. Raborn graduated from the Medical College of Virginia school of dentistry in 1965. He interned at the United States Navy Hospital at

Camp Pendleton, California, and served overseas as part of a Navy medical team in Vietnam.

In addition to his teaching responsibilities at Alberta, Dr. Raborn has held positions at the University of North Carolina at Chapel Hill and the University of Connecticut Health Centre. His major research interests include anti-viral drugs and analgesics, and his special interests include hospital dentistry and the management of the medically compromised dental patient.

With the agreement to integrate Alberta's faculty of dentistry into a restructured faculty of medicine, Dr. Raborn believes that dental education in Alberta is ready to face the future.

"The facts are that the oral health sciences are alive and well in Western Canada at the University of Alberta ..." This new administrative alignment will allow us to take advantage of many of the recommendations made in the United

Canadian Dentistry Mourns Dr. Bill Spence

Dr. William James Spence, a prominent figure in Canadian and International dentistry for over 40 years, died suddenly in Palm Springs, California, last month. He was 72.

At the time of his death, Dr. Spence was attending a meeting of the International College of Dentists (ICD). He had travelled to Palm Springs immediately following his attendance at an ICD meeting held in conjunction with the American Dental Association meeting in Las Vegas.

Dr. Spence was born in Toronto on December 13, 1922. He served as a pilot in the Royal Canadian Air Force from 1941 to 1945, and retired from the force with the rank of flight lieutenant. He then returned to Toronto to pursue his education, and subsequently received his dental degree from the University of Toronto in 1951 and his master of science degree with a specialty in orthodontics from Northwestern University in Chicago in 1953.

Following his graduation, Dr. Spence entered into private practice in Toronto. During this time he was also a member of the staff at the Hospital for Sick Children and a consultant in orthodontics in the University of Toronto's faculty of dentistry.

Throughout his career, there was hardly an area of organized dentistry in which Dr. Spence was not involved, and he invariably rose to the top within a very short time. His involvement began in 1956, when he became a council-



Dr. William James Spence: 1922-1995

lor for the North Toronto Dental Society. He was appointed as a governor of the Ontario Dental Association in 1962 and elected as its president in 1968, succeeding Dr. Bruce Taylor, who had ushered in ODA's new constitution and the first of the "big boards."

In his ODA president's address in 1968, Dr. Spence outlined a philosophy that has held true to this day: "The affairs of dentistry can be directed by the dentist for the dentist — keeping in mind always that every dentist should have a direct line of personal communication through his component society with the ODA board of governors and directly through them to the top echelon of the Canadian Dental Association."

Truly following his own heart, Dr. Spence served as a CDA executive council member from

1963 to 1969 and was president of the national body in 1970-71.

Shortly after completing his term as CDA president, Dr. Spence was named to the management committee of CDSPI. He served as president of dentistry's insurance arm in 1973-74.

Dr. Spence's name is also synonymous with the International College of Dentistry. He became a fellow of the organization in 1967, and was appointed deputy registrar of ICD's Canadian section in 1975. He became registrar in 1977 — a post he conscientiously fulfilled until the time of his death.

For more than 20 years, there has not been a Canadian elected to the International College of Dentistry who has not been welcomed by Bill Spence's warm handshake. Among his proudest achievements was his election to the office of ICD international president in 1985 and as an ICD master in 1990.

Dr. Spence was also a fellow of the Academy of Dentistry International and the American College of Dentists. In 1985 he received an honorary fellowship in the Academy of International Dental Studies and was made an honorary life member of the Toronto Academy of Dentistry in 1988.

Tributes to Dr. Spence may be made by contributing to the International College of Dentists (Canada) Developing Fund, which is administered through the Dentistry Canada Fund, 1815 Alta Vista Drive, Ottawa, ON K1G 3Y6. ■

States Institute of Medicine report on dental education published in January 1995. Included are curriculum changes that will include many combined courses for our dental and medical students during the first two years of the DDS program. Research and academic opportunities will be enhanced for our department of oral health sciences in the oral biology area because of their new alignment with the various other basic science depart-

ments within the faculty of medicine and oral health sciences."

With the re-alignment in April 1996, dental students will be required to complete a new 10-week spring term, which will create a full 30 weeks of additional education for DDS students and 10 weeks for dental hygiene students. This 10-week term is a reflection of the need to become more cost effective in the utilization of clinical and academic facilities. In addition, to allow dental students to compete

more effectively with the medical students during the first two years of their program, there will be a decompression of the fall and winter terms. This will require many pre-clinical courses to be moved from the fall and winter terms to the new 10-week spring term. The dental clinical programs will operate in the usual manner within the university, with all activities and services becoming cost neutral to university budgets. ■

Health Canada Seeks Assistance Locating TMJ Implant Patients

Health Canada is seeking dentists' help in locating TMJ implant patients who may be affected by the \$30-million settlement reached in a recent U.S. class action lawsuit.

The settlement involves patients who received Proplast TMJ implants in either Canada or the United States. A September 7, 1995, bulletin released by the director of Health Canada's Medical Devices Bureau, Dr. Richard S. Tobin, states:

"Health Canada understands that you may see patients who have received Proplast temporomandibular joint (TMJ) implants. As the department does not have a list of all the Canadian patients with these implants, we request your assistance in communicating the following information to them.

"Recently, the American Proplast (TMJ) Class Action Settlement published an advertisement in Canadian newspapers advising TMJ recipients about a Summary Notice of Settlement. If patients need more information regarding this settlement, they should write to: Proplast

TMJ Class Action Settlement, P.O. Box 2, Cromwell, Connecticut, U.S.A. 06416-0002, or call the Settlement number at 1-800-514-7007. If they need legal advice regarding this settlement, they should consult a lawyer.

"Concerns about TMJ implants or any other medical device may be communicated to the Medical Devices Bureau by calling the toll-free Hot-Line at 1-800-267-9675." ■

California Approves New Fluoridation Measures

Thanks to a bill approved by the California senate September 14, millions of additional California residents will benefit from fluoridated water supplies.

The new law requires all communities of more than 10,000 to adjust their water supplies to an optimum fluoride level by January 1, 1997.

Currently, with only 17 per cent of its residents benefitting from fluoridated water supplies, California ranks 47th among U.S. states for the availability of fluoridated water. The new legislation will encompass approximately 75 per cent of the

state's population of more than 30 million.

The California Dental Association was instrumental in encouraging the state's 23,000-plus dentists to support the fluoride legislation. ■

CDAnet Updates

Effective November 1, Manulife Financial will use BIN 610059 for all EDI claims processed on the NDC network. The old Manulife BIN will be discontinued and all claims for Confederation Life, Manufacturers Life Insurance Co., and Manulife Financial will be transmitted through Manulife's 610059 BIN.

"This change enables Manulife, and providers of dental services, to take full advantage of real-time EDI functionality," said Carol Baker, Manulife's manager, health and dental claims project.

In a related move, Manulife has reverted to issuing individual cheques for each assigned claim payment, rather than issuing a single cheque covering several claims. The change was required as part of the company's ongoing systems integration efforts, and is expected to be temporary. ■

LIBRARY PACKAGE

The CDA resource centre's search of the month for November is **HEADACHES**. CDA members can order a copy of this series for a cost of \$5, plus applicable taxes, by calling the CDA resource centre at 1-800-267-6354 extension 223.

Don't forget to ask for a complete list of the more than 60 packages available — they're a valuable tool for keeping informed on issues of concern to your dental practice.

NEW ACQUISITIONS

CDA members can borrow each of the following new acquisitions for a \$5 (plus applicable taxes) shipping fee.

VIDEOS:

Complications of third molar removal and their management. Williams, T.P. AAOMS, 120 min.

Infections: Host defense, antibiotics, and clinical management. Devlin, D.H. et al. AAOMS, 105 min.

Surgical treatment of TMJ disorders. James, R.B. AAOMS, 120 min.

Symposium on implants: Prosthetic considerations; Soft tissue considerations; Guided bone regeneration. AAOMS, 120 min.

BOOKS:

Athanasίου, A. *Orthodontic cephalometry.* Mosby-Wolfe: London, 1995.

Berkowitz, B.K.B., Moxham, B.J. and Newman, H.N. *The periodontal ligament in health and disease.* 2nd ed. Mosby-Wolfe: London, 1995.

Goldstein, R.E. and Garber, D.A. *Complete dental bleaching.* Quintessence: Chicago, 1995.

Ingle, J.I. and Bakland, L.K. *Endodontics.* 4th ed. Williams & Wilkins: Baltimore, 1994.

Pertes, R.A. and Gross, S.G. *Clinical management of temporomandibular disorders and orofacial pain.* Quintessence: Chicago, 1995.

Stock, C.J.R. et al. *Color atlas and text of endodontics.* 2nd ed. Mosby-Wolfe: London, 1995.

Pindborg, J.J. and Reichart, P.A. *Atlas of diseases of the oral cavity.* Munksgaard: Copenhagen, 1995.

E x p e r D e n t

ALBERTA

CALGARY SOUTHWEST – New office in strip mall of long time Calgary practice. Good equipment. Owner retiring after 40 plus years. Great opportunity for young dentist as a start-up practice. Vendor will work through transition if requested. Well priced. TAI028

CALGARY STRIP MALL – 3 ops, computerized. Solid gross, excellent net. Equipment and premises approx. 5 yrs old. New 5 yr lease. TAI027

DOWNTOWN CALGARY – Newer facility and equipment. 2 ops with provisions for 4, Pan, state-of-the-art computer system, good exposure. Billing \$500,00 and continuing strong growth. Owner leaving province. TAI019

EAST CENTRAL ALBERTA – Thriving, growing practice located in rural community. Recently renovated facility. 3 ops, Pan, computerized, 1,500 active patients with 30-40 new patients per month. Gross billings approx. \$500,000. TAI020

EDMONTON – Main street access, 3 ops plus one hygiene room. Pan/ceph, computerized, long term staff. Solid patient base with high health IQ. Excellent recare program. Grossing \$400,000. Owner leaving city. TAI031

NORTH WEST CALGARY – Established community practice with good gross billing providing solid net income to owner. Strip mall location beside other health professionals. 2 ops, Pan, computerized. TAI025

RURAL PRACTICE – Central Alberta location approx. 1 hour from Edmonton. 2 ops, Pan, located with medical clinic. Equipment approx. 10 years old. Expenses approx. 40% of gross. Superior net income. TAI030

SOUTH CALGARY – Well established practice on main street. 3 ops, computerized, large patient base. Strong gross billing, solid net income. Owner returning to graduate school. TAI029

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Your Annual Insurance Review: A Time To Look Forward, A Time To Look Back

When it comes to insurance planning, this is the time of year to look both forward and back. Forward, because it's just about time to renew your insurance program. Back, because you need to review the changes in your personal life and practice to determine how your insurance coverage should change.

It's also an opportune time for insurance planning, since this is the month when you'll hear about the 1996 changes to the Canadian Dentists' Insurance Program.

Not much has changed in our program for 1996. That's good news for your insurance budget, since it means almost no premium increases. In fact, all premium rates for the Canadian Dentists' Insurance Program plans are the same as in 1995 except for moderate increases to two plans — TripleGuard and malpractice insurance. The malpractice plan also has a premium surcharge for dentists who have had two or more claims during the past six years. Data processing insurance, which is now integrated into TripleGuard, is no longer available as a separate plan. Also, office contents, comprehensive general liability and practice interruption insurance — the three components of TripleGuard — can no longer be purchased individually (though current participants in any of these three plans can continue such coverage).

The only other change for 1996 concerns your premium payment. Here, the processing charge for quarterly and monthly payments has been reduced from two per cent to 1.75 per cent, with a \$25 maximum on monthly payments and a \$75 maximum on quarterly payments (this change actually took effect October 1, 1995).

Like last year, participants in the Canadian Dentists' Insurance Program will receive a booklet in the mail that includes all plan descriptions and premiums. The 1996 booklet, "Building Your Insurance Program," also includes more detailed guidelines on how to plan your coverage. You can use these guidelines as the basis for determining appropriate levels of new coverage, or determining what changes to make to existing coverage.

Review 1995 Changes

As you read the booklet's guidelines, it's important to review any changes in your personal life and practice during 1995 that may affect your optimum insurance coverage for 1996. For example:

- An increase in your income means you should consider increasing your life insurance and long-term disability coverage.
- Landmark events in your personal and family life may trigger a need for changes to your personal insurance program. If there has been a marriage or a new child in your family, or you've taken on more loans or

debts, you will need more life insurance. Similarly, purchasing a home, vacation property or boat can mean taking out or increasing your personal umbrella liability insurance. And if your spouse is earning more income, you may need more dependents' life insurance coverage.

- The hiring of a new staff member, or an increase in rent, salaries or any other overhead costs, triggers a need for an increase in your office overhead expense insurance coverage.
- The purchase of new equipment or furnishings, or improvements to your office, calls for an increase in your TripleGuard coverage.
- An increase in your patient load triggers a potential need for more malpractice coverage, since the chance of a malpractice suit increases with the number of active patients in your practice. Even taking courses to upgrade your skills, and then doing new — perhaps higher risk — procedures, should be considered as one more reason to consider increasing your malpractice coverage. (Dentists in Ontario and Quebec must obtain malpractice insurance through their provincial licensing bodies).

Most of these "triggers" relate to your existing insurance coverage. But at this time of year, you must also plan new coverage. So consider the consequences if you were to experience a loss in any

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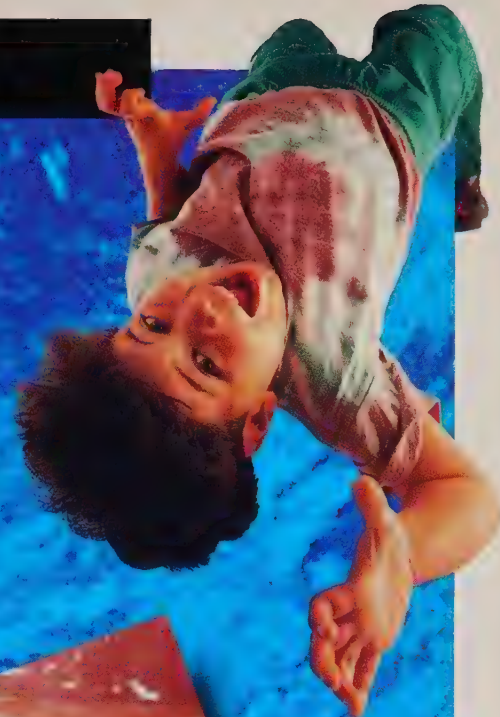
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area for which you are not currently insured, and purchase coverage accordingly.

It's also important to stay on top of new plans. For example, a few months ago the Canadian Dentists' Insurance Program introduced travel insurance for the dental profession. It's already becoming very popular, largely because the coverage is comprehensive, and it costs about the same to cover yourself for an unlimited number of trips over a one-year period as many other plans' charge for just one trip.

Insurance Review Service

Once you've decided what insurance to purchase, you must still decide who to purchase your coverage from. Of course, this is an

ongoing issue for dentists, who are called on regularly by insurance agents and brokers. An easy and reliable way to evaluate your existing coverage or any new proposals from agents is to use CDSPI's Insurance Review Service. You simply send CDSPI the policy or proposal, and it's forwarded to an independent reviewer who will provide you with a written evaluation — all at no cost to you. CDSPI regularly receives positive feedback from dentists who use the Insurance Review Service, so give it some serious thought.

While on the subject of evaluating insurance plans, an independent report commissioned by CDSPI recently compared three Canadian Dentists' Insurance Program plans to other leading plans

in the marketplace. Our program's basic life insurance, long-term disability and office overhead expense insurance plans all proved to be highly competitive coverage-wise and, in general, the premiums for all three plans were lower than comparable plans in the individual insurance market.

It's insurance planning season. Take the time to examine your coverage, to make any necessary changes, and make sure you're satisfied with the policies you have or are considering. It may be tempting to take the easy route and simply renew all of your plans as they stand, but you should conduct a proper review of your personal and practice insurance program for full protection against all financial risks. ■

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Common Stock	2.8%	5.7%	11.5%	12.3%	✓10.5%	10.4%	✓ 10.1%	8.6%
Balanced	✓ 10.0%	8.9%	8.5%	9.9%	10.2%	10.6%	✓ 9.5%	8.7%
Bond & Mortgage	✓ 12.7%	12.3%	✓ 7.9%	7.4%	✓ 11.4%	10.8%	✓ 10.3%	10.1%
Money Market	✓ 6.6%	5.9%	✓ 5.6%	5.0%	✓ 6.9%	6.4%	✓ 8.3%	7.9%
International Equity	✓ 14.1%	5.2%	n/a		n/a		n/a	
European	✓ 30.3%	11.2%	n/a		n/a		n/a	
Pacific Basin	✓ 9.1%	-7.5%	n/a		n/a		n/a	
Emerging Markets	✓ -16.1%	-22.0%	n/a		n/a		n/a	

[†] CDA figures indicate annual compound rate of return with all fees deducted. The figures are historic rates based on past performance and are not necessarily indicative of future performance.

* Comparison performance figures are Globe and Mail averages for the range of similar funds offered in the marketplace before sales charges, as published in the October 19, 1995 issue.

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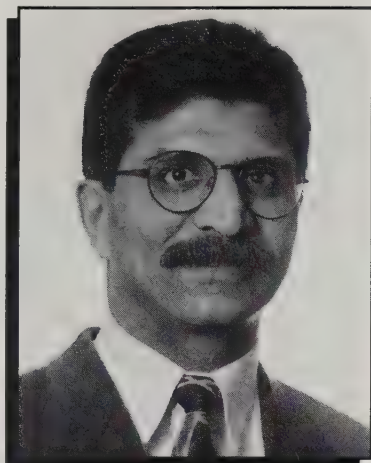
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⁽¹⁾ Data on file - Block Drug Co. (Canada) Ltd.



Put It In Writing: The Importance Of An Office Policy Manual

Imtiaz Manji, B.Sc.

Principal of ExperDent

There's an interesting phenomenon that occurs all too often when I visit a dental practice that uses an office policy manual — I sense the existence of this all important document long before I'm told about it.

But, then, there are a few tell-tale signs to watch for. The most salient indicator may be the feeling of harmony radiated by these practices, which are characterized by low employee turnover, a sound organizational structure, and high team morale.

At this point you're probably asking yourself, "How does a printed document achieve such lofty objectives?" Well, the truth of the matter is that an office policy manual can't accomplish much on its own, nor can it fix existing management problems. But when it functions in conjunction with other practice management systems, its contribution to overall practice excellence cannot be underestimated. (In other words, while the absence of a policy manual is often quite conspicuous, its presence is only beneficial in practices where solid management principles exist. If you look to a policy manual to create — rather than add to — harmony in your practice, you'll be steering yourself and your team in the wrong direction.)

Why Have a Policy Manual?

If a policy manual can't create harmony or solve problems, what can it do?

The answer, quite simply, is that an office policy manual can prevent problems from happening. It allows you to cover off, in a single document, those sensitive areas that seem to rear themselves time and again, be it your policy on salary reviews, overtime pay, performance evaluation, sick leave or what staff (particularly the hygiene team) should be doing during downtime. You'll find that the time and energy you invest to develop a solid, respected policy manual will be far less than the aggravation you'd experience by having to repeat policies verbally, or worse, to deal with the potential fallout that comes in the absence of this type of document.

A policy manual outlines the mutual expectations of the practice and the team. It's not enough to conduct thorough employment interviews and hire the right people. Once your staff is in place, they need guidance on everything from dress code and vacation time, to absenteeism and continuing education. They need to know what you're looking for from them in terms of behavior, and also what they can expect from you. (In

other words, the manual shouldn't be one-sided in the employer's favor.)

Consider this example: An employee believes that he or she can take their allotted two weeks vacation at any time during the year. Your practice's policy, albeit an unwritten one, is to close for two weeks during December. How these disparate ideas occurred cannot be traced — it was a verbal conversation — so the employee ends up disgruntled by the "surprise," while you end up leery of the employee. This isn't a very good start to forming a healthy employer-employee relationship. A policy manual could have averted the entire scenario by serving to backup the verbal agreement.

Another scenario concerns termination. Unfortunately, I've spoken to more than a few dentists who honestly believed that they had given ample warnings and thorough explanations of the basis for their decisions prior to letting employees go. Later these dentists found out (sometimes via a lawyer) that the employees didn't understand the reasons for the termination. Claims may be made that the dentists never conveyed — neither verbally nor in writing — why the employee wasn't meeting the practice's expectations. However, when a policy manual is in place, the dentist and team have a clear



understanding about the process for dealing with poor performance. The reasons that could lead to dismissal are documented for everyone to see (and to insure that fairness is adhered to). Such measures are also important in terms of the various laws regarding employment standards — nothing in your manual should contravene employment legislation.

If you don't already have an office policy manual, take a moment and consider what's likely to happen the first time you don't say "yes" to one of your staff in a situation where he or she expects you to. That staff member is likely to feel that you have reneged on your obligations. In other words, no matter how good things may be, you're really only one incident away from a problem — a problem of miscommunication that could be easily prevented by a policy manual.

Before I get into discussing some of points that you may want to include in your manual, a word of caution: as previously mentioned, don't expect a policy manual to do any more than its intended purpose. Some practices try to solve existing staff management problems by creating a policy manual. For instance, if the dentist has trouble saying "no," he or she may be tempted to point to a book and say "All the answers are in there." This is an inappropriate use of a policy manual.

What To Include

Every practice is different. It follows, therefore, that no two policy manuals should be identical. The first rule of thumb is to make sure that you're prepared to live up to, at a minimum, whatever you commit to paper in the manual. This isn't to say that you won't consider individual circumstances as they arise, but the policy manual isn't meant to be a customized document for each team member. It's a blanket document that covers everyone. Exceptions to the policies, although not encouraged, can be considered.

For instance, if your bereavement leave policy allows employees to take three days with pay for

the loss of an immediate family member, that would be the minimum you would offer each employee. However, if a team member is appointed the executor of a will, and the deceased lived across the country, three days bereavement leave would likely be insufficient. In this case, you should retain the flexibility to grant more time off, with or without pay, and work with the employee to achieve a mutually acceptable decision.

In essence, you must be careful in the policy manual to commit to a standard that you're willing to uphold across the board, while accepting that exceptions to the policies may be made (at either your or your office manager's discretion).

It's important not to confuse a policy manual with a training manual, which outlines specific procedures for staff on everything from how to handle inventory control and infection control, to continuing care appointments and financial arrangements. Although you should outline these types of procedures in a printed document, this won't replace a policy manual. Written procedures, often used as an adjunct training tool for orienting new staff, are quite distinct from practice policies.

Here are some of the areas that you should cover off in your office policy manual:

- job descriptions
- glossary/definitions of the terms used in manual (e.g., probationary period, casual employee, etc.)
- code of conduct
- absenteeism and tardiness
- public holidays
- performance reviews
- salary reviews
- resignation and termination
- hours of work
- dress code
- grooming and hygiene
- employee benefits (statutory and additional), including leave of absence, vacations, bereavement leave, continuing education, medical and dental, paren-

tal leave, sick leave, clothing allowance, jury duty, bonuses, RRSPs, etc.

When you describe each area in the policy manual, you want to make the document readable, concise, and clear. Here's a sample of an office policy on grooming and hygiene:

Grooming and Hygiene

Purpose:

To establish grooming standards consistent to the dental health-care profession.

Policy:

Employees should maintain excellent oral hygiene and visit a hygienist regularly. Breath should be fresh and never offensive to others. Gum chewing is not permitted within view of a patient. Brushing and mouthwash are preferred alternatives to gum. It is considered a courtesy to advise a dentist or employee if their breath is offensive. This comment, when presented in private, will be taken without offense. The person may not be aware that their breath is offensive.

All clinical staff should keep their hair groomed to prevent a problem when working with patients. Long hair should be tied back away from the face.

Nail polish should be conservatively and carefully maintained. Nails should be trimmed and short or moderate in length.

The odor of smoke or perspiration from clothes or the body is not acceptable. The office is designated a non-smoking area.

The above example clearly outlines the purpose of the grooming and hygiene policy, and how the team can adhere to it. Interestingly and purposefully, the wording isn't just clear, it's also careful. Take a look at the last paragraph about smoking. It doesn't say that employees must be non-smokers (this would be an infringement of their rights), but it does say that the odor of smoke will not be tolerated, which is a perfectly reasonable request. With each manual entry, keep in mind that your policies cannot supersede the law.

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Regardless of what policies you implement, it's important to know the reasons behind each policy (in

the case above, it may be that financial circumstances don't allow you to continue to give each staff member four weeks vacation) and to discuss the rationale with your team. It's also vital that the policy manual exists as a dynamic document, which can be easily amended as needed. A good policy manual is relevant, up-to-date,

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LETTERS ...

Continued from page 922

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Oral Cancer

As a student of clinical epidemiology, I read with interest the article on diagnostic tests that appeared in the September 1995 issue of the *CDA Journal* (Matthews, D.C., Banting, D.W. and Bohay, R.N. The Use Of Diagnostic Tests To Aid Clinical Diagnosis. 61:785-791, 1995.), and congratulate the authors on an informative article. There are, however, two points that I believe need clarification.

In discussing likelihood ratios, the authors state that "one advantage of the use of likelihood ratios over sensitivity and specificity is that they are unaffected by how common the disease is in the population (disease preference)." In fact, the sensitivity and specificity are considered stable properties of a diagnostic test and are thus unaffected by disease prevalence. The properties of a diagnostic test that are affected by disease prevalence are the positive and negative predictive values.

In the clinical example cited in the article, the term incidence is used rather than prevalence to report the occurrence of seven cases of oral carcinoma in females per 100,000 individuals.

Euan Swan, DDS, DDPH,
MRCD(C)

Gloucester, Ontario

HIV Discrimination Case

I read with interest the article in the July-August *Communiqué* that reported the charge of discrimination against the Ottawa dentist who used extra barrier protection when treating an HIV-positive patient.

I am completely opposed to the actions of the Ontario Human Rights Commission (these commissions routinely proceed in ways that defy logic), but even more concerned that the dentist's own college agreed that the dentist acted in a discriminatory manner. Do dentists not have the right to protect themselves, their staff, and their other patients?

Let me give some examples to illustrate this point. Suppose I am travelling down a very busy, narrow road with my family on a long weekend. There is a good chance that some of the drivers approaching me are impaired, because there is a great deal of celebrating going on. I therefore will be very cautious as I approach oncoming vehicles. If I see a car coming towards me swerving erratically, would anyone expect me to continue without taking extra precautions? A prudent driver would pull over and stop, or even find a turnout to get off the road to lessen the chances of a terrible accident. And if I did this, would I be liable to be sued by some impaired driver for discriminating against him? I would hope not!

If I enjoy gardening and get dirt under my nails, would my patients

not want me to spend extra time and use more thorough cleaning methods to ensure my hands are clean and that all traces of organic fertilizer were removed before I donned my gloves to invade their mouth? I am sure they would. When I am a dental patient, I would insist that my dentist use universal precautions against disease, but if I were a patient in his office following a known infectious patient, I would applaud my dentist for using extra precautions in my behalf.

I recently spoke with a friend of mine who works in a hospital as an operating room nurse. She told me that the surgeons and their assistants will often double glove and use face shields in cases where infectious diseases are present, whereas they will not take extra precautions when routine "clean" surgery is performed. Also, if the case is considered "contaminated," such as with a perforated bowel or when pus is encountered, there are extra precautions taken when cleaning the instruments used and the operating theatre. I would suggest these prudent procedures are those which would best avoid transmission of infectious diseases to other patients and are in no way discriminatory.

I recognize the responsibility we have to take universal precautions and agree that these should be sufficient to protect dental staff and patients from all disease transmission from known and unknown disease carriers. But I personally reject the idea that we cannot take extra precautions when we encounter a known infectious disease, whatever it is. It is also my view that we need and should be allowed to use more common sense as we practise, and as we deal with patients who claim discrimination. Many of these people who claim discrimination are only looking to enjoy a sizeable financial payout at the expense of an easy target — the dentist. It seems that even our dental associations are encouraging this by the stance they take in situations such as the one with the Ottawa dentist. I would also urge our national and provincial dental association to be a little less concerned about being politically correct, and more concerned about protecting the rights of their members, the dentists.

Myron A. Peterson, B.Sc., DDS
Cardston, Alberta

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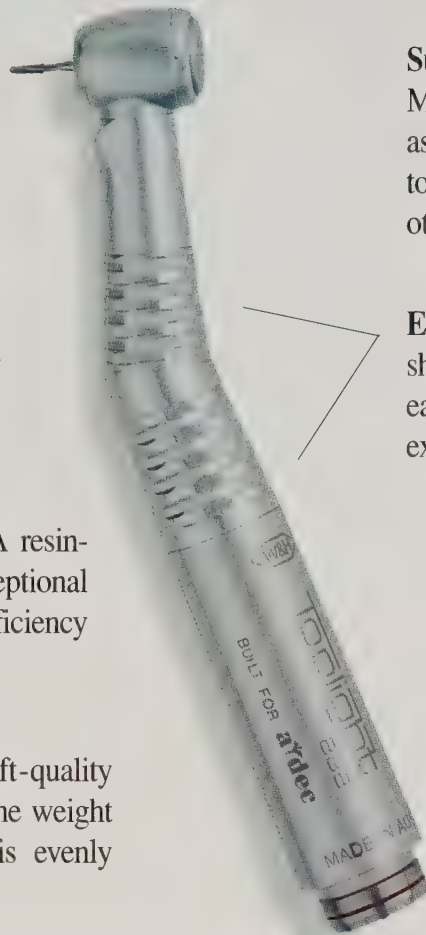
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SELF-LEARNING SELF-ASSESSMENT

The SLSA Program is published as a monthly feature in the *Journal of the Canadian Dental Association* as a resource for dentists wishing to enhance their dental knowledge and expertise. It is intended as a vehicle for self-learning and self-assessment. The program is based on a series of 40 questions, answers, rationales, and references, followed by an annual 15-question quiz. The 1995-96 quiz will appear in the June 1996 issue of the *Journal*. Answers to the quiz will be published in the August 1996 issue. Dentists who complete the quiz may be eligible to receive continuing education points, and their names will be forwarded to their provincial licensing bodies for consideration.

Questions 6 through 10 are a repeat of the questions that appeared in the October issue of the *Journal* accompanied with correct answers, the rationales and specific references. Question 11 through 15 are new questions — watch for their answers and rationales next month. Keep all copies of the *Journal* so you can correctly respond to the June 1996 quiz.

QUESTION 6

Drug concentration in the body varies according to

- A. dosage given.
- B. age of the patient.
- C. fat to lean body mass ratio.
- D. cardiovascular status.
- E. All of the above.

ANSWER: E

RATIONALE:

Drug concentration in the blood is dependent upon absorption, distribution and elimination. Age influences these three parameters. Although there is an increase in pH of the gastro-intestinal tract with aging there is also a concomitant decrease in the absorbing surface and decreased gastro-intestinal mobility. Once in the blood stream, drugs distribute to various tissues depending upon their nature. In the elderly, there is a significant increase in the fat to lean body mass ratio and a decreased cardiac output compared to the younger person.

Elimination of drugs occurs by liver metabolism and/or kidney excretion, depending on the drug. Drugs excreted by the kidneys are eliminated more slowly in the elderly because of reduced function resulting from decreased blood flow. In addition, both the mass and function of the liver, including the blood flow, decrease with age. It is important, therefore, for the dentist to understand the drug related challenges that are present in the elderly and

to maintain familiarity with the possible risks involved.

REFERENCES:

- (1) Grymonpre, R. and Galan, D. Challenges associated with drug use in the elderly: Implications for dentistry. *J Can Dent Assoc* 57:203-207, 1991.

QUESTION 7

Which of the following artificial sweeteners are non-cariogenic and non-caloric?

- (1) Xylitol.
- (2) Saccharin.
- (3) Sorbitol.
- (4) Aspartame.

- A. (1) (2) (3)
- B. (1) and (3)
- C. (2) and (4)
- D. (4) only
- E. All of the above.

ANSWER: C

RATIONALE:

Sweeteners are classified as bulk or intense. In general, the bulk sweeteners are non-cariogenic but contain the same calories as sugars. Xylitol and Sorbitol are bulk sweeteners and therefore caloric. Saccharin and Aspartame are intense sweeteners and are virtually calorie-free as well as being non-cariogenic.

Saccharin was one of the first intense sweeteners to be discovered in the late 19th century. It is 200-500 times sweeter than sucrose and until recently was used extensively to sweeten foods and low calorie drinks. It is gradually being replaced by new sweeteners such as Aspartame.

Aspartame is a combination of aspartic acid and phenylalanine. It is two hundred times sweeter than sucrose and is sold under the trade name of Nutra Sweet. It loses its taste on heating and should be avoided by people with phenylketonuria since this condition is a genetic defect of phenylalanine metabolism.

REFERENCES:

- (1) Shaw, J.H. and Roussos, G.G. *Sweeteners and dental caries*. Information Retrieval Inc. Washington, D.C.
- (2) Rugg-Gunn, A.J. and Edgar, W.M. Sweeteners and dental health. *Community Dent Health* 2:213, 1985.

QUESTION 8

Terfenadine (Seldane)

- A. is an antihistamine.
- B. is metabolised in the liver.
- C. interacts with erythromycin.
- D. All of the above.
- E. None of the above.

ANSWER: D

RATIONALE:

Terfenadine (Seldane) is an over-the-counter antihistamine commonly used in the treatment of hay fever. Recent research has shown that when administered along with either the antifungal agent ketoconazole (Nizoral) or erythromycin there are adverse effects.

With Nizoral, patients taking Seldane can develop life threatening ventricular arrhythmias. Erythromycin interferes with the liver metabolism of Seldane by forming compounds that inhibit enzyme breakdown which can lead to cardiac toxicity and ventricular tachycardia. Other macrolide antibiotics like erythromycin are being investigated for similar properties.

REFERENCES:

- (1) Wynn, R.L. Erythromycin and Ketoconazole (Nizoral) associated with Terfenadine (Seldane) — induced ventricular arrhythmias. *Gen Dent* 41(i):27-29, 1993.

- (2) Becker, D.E. Drug interactions in dental practice: a summary of facts and controversies. *Compendium* 15(10), 1994.

QUESTION 9

Success of an endosseous dental implant is dependent upon

- (1) biocompatibility of the material.
- (2) design.
- (3) a period of non-function.
- (4) immediate loading.
- (5) prosthodontic treatment.

- A. (1) (2) (3)
- B. (1) (2) (4)
- C. (1) (2) (3) (5)
- D. (1) (2) (3) (4)

ANSWER: C

RATIONALE:

Biocompatibility has been recognized as a necessary property for success of any implant. However, it should be noted that not only the materials used for implant fabrication but also the design of the implant will determine the overall tissue response. Premature function can result in excessive movement of the implant relative to its host bone during the early healing phase. Such movement could result in the formation of fibrous tissue rather than bone in close apposition to the implant surface and epithelial downgrowth at the "gingival" cuff around the implant will be accelerated. Therefore, in order to allow rigid implant fixation to occur (osseointegration) there is a need for a period of non-function (or limited function) after implant insertion. Success is equally dependent upon the prosthodontic treatment and the design of appliances is important, particularly in avoidance of plaque retention.

REFERENCES:

- (1) Pilliar, R.M. Dental implants: Materials and design. *J Can Dent Assoc* 56(9):857-860, 1990.
- (2) Worthington, P., Brånemark, P-I. Advanced Osseointegration Surgery. *Applications in the Maxillofacial Region*. Quintessence Publishing Co. 1992.

QUESTION 10

Which of the following are recognised as clinical characteristics of calcium hydroxide materials?

- (1) Bacteriocidal to bacteriostatic.
- (2) High pH stimulates fibroblasts.
- (3) Accelerates internal resorption after trauma.
- (4) Adheres to vital dentin.
- (5) Excellent for root canal medication.

- A. (1) (2) (3)
- B. (2) (3) (4)
- C. (1) (2) (5)
- D. All of the above.

ANSWER: C

RATIONALE:

Although calcium hydroxide formulations are still thought to stimulate reparative dentin and form a dentin bridge over pulp exposures there is little scientific support for the claim. Studies have shown that these formulations are valuable antimicrobials for both restorative and endodontic treatment, especially so in nonvital teeth with periapical radiolucencies. The high pH neutralises the low pH of the infected tissues and also stimulates cell enzyme systems causing fibroblast proliferation, migration, healing and repair. After severe tooth trauma the use of calcium hydroxide halts internal root resorption. A significant characteristic of calcium hydroxide is its inability to seal vital dentin against micro-leakage and it is also a poor insulator. Recent research has demonstrated the need for control of micro-leakage from dentin for management of post-operative pain as well as pulpal healing. The placing of calcium hydroxide as a liner on sound dentin serves no clinical purpose since it does not adhere to vital dentin and associated hydroxyl ions cannot penetrate the tubules to stimulate pulpal fibroblasts to form reparative dentin. Use of modern etchants, primers and resin materials causes a durable hybridised or resin impregnated layer to be formed which maintains the complete integrity of the pulp/dentin unit. This in turn benefits insulation, controls postoperative pain and ensures future pulp health.

REFERENCES:

- (1) Cox, C.F. and Suzuki, S. Re-evaluating pulp protection: Calcium hydroxide liners vs cohesive hybridisation. *JADA* 125(7):823-831, 1994.
- (2) Leinfelder, K.F. Changing restorative traditions: the use of bases and liners. *JADA* 125:65-67, 1994.
- (3) The Oral Care Report. Ed. G. Nikiforuk. Vol. 5, March 1995.

The SLSA program is a resource and service, directed to the dental profession and the licensing authorities, which is intended to help dentists achieve and maintain the high levels of expertise and competence identified by Canadian dental licensing authorities. All questions and other material are based on current, referenced literature.

Financial support for the program has been provided by A-dec, Colgate, the Fowler-Pearce Partnership (Nesbitt Burns), Nobelpharma, and Sci-Can.

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The views expressed in the questions, answers, rationales, reversal questions and reversal answers of the SLSA program are not necessarily those of the Canadian Dental Association or its related organizations.

THIS MONTH'S FIVE NEW QUESTIONS

QUESTION 11

Bonded amalgam restorations differ from conventional amalgam restorations in that they

- (1) are more conservative of tooth tissue.
- (2) decrease post-operative sensitivity.
- (3) have increased marginal leakage.
- (4) are less likely to lead to cusp fracture.

- A. (1) (3) (4)
- B. (1) (2) (3)
- C. (2) (3) (4)
- D. (1) (2) (4)

CDA encourages Canadian dental licensing authorities to recognize the SLSA program as an appropriate and acceptable resource for dentists seeking to earn the continuing education credits required for the maintenance of licensure.

Currently, all 10 provincial licensing bodies — British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland — recognize the SLSA program for continuing education credits.

QUESTION 12

For local infiltration anesthesia, a dentist may use 2 per cent lidocaine with or without epinephrine. When compared to a solution without epinephrine, 2 per cent lidocaine with 1:100,000 epinephrine will result in

- (1) increased heart rate.
- (2) improved anesthesia.
- (3) increased arterial pressure.
- (4) increased hemostasis.

- A. (1) and (3)
- B. (2) and (4)
- C. (1) (2) (4)
- D. All of the above.

QUESTION 13

Recession of the gingivae on the labial aspects of mandibular incisors of children

- (1) is found in 25 per cent of children.
- (2) should be corrected as soon as possible by gingival grafts.
- (3) requires correction by lateral flap surgery.
- (4) is self correcting.

- A. (1) and (2)
- B. (2) only
- C. (1) and (4)
- D. (4) only

QUESTION 14

A panoramic film of a 20-year old male patient shows unerupted mandibular third molars. When determining whether these teeth will erupt, which of the following are reliable predictors of eruption?

- (1) Sufficient mesiodistal third molar space.
- (2) Impaction in soft tissue only.
- (3) Mesioangularity of the unerupted molar.
- (4) The unerupted molar at the same occlusal level as the second molar.
- (5) Verticality of the unerupted molar.

- A. (1) and (2)
- B. (1) (2) (3)
- C. (1) (2) (4) (5)
- D. All of the above.

QUESTION 15

Composite resin restorations may be used in posterior teeth when

- (1) centric stops on the occlusal surface will be supported on the composite resin.
- (2) esthetics is important.
- (3) the bucco-lingual width of the cavity preparation is less than one-third of the intercuspal width of the tooth.
- (4) butt-end joints between the tooth and the composite resin can be provided.
- (5) the gingival cavosurface margin is subgingival.

- A. (1) (2) (3)
- B. (2) (3) (4)
- C. (2) (3) (5)
- D. (1) (2) (5)

(Answers to questions 11-15 will appear in next month's *Journal*.)

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| Clinical Oral Pathology | — Clinical Features and Diagnostic Procedures to Differentiate Common Reactive Ulcers and Pigmented Lesions from Clinically Important Lesions |
| Dr. D. Haas | — Pain Control: Analgesics, Local Anaesthetics and their Vasoconstrictors |
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| Endodontics | — Restoration of Endodontically Treated Tooth |
| Dr. P. Cyr | — Mandibular Anesthesia — The "Hot Tooth" |
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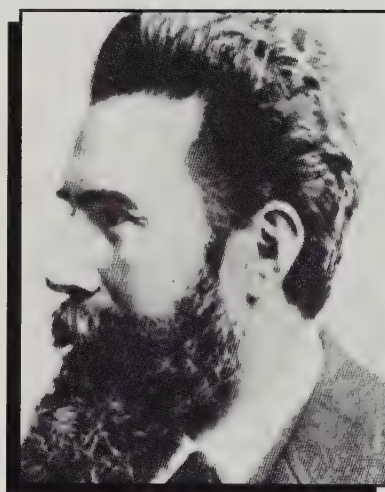
One hundred years ago — on November 8, 1885, to be exact — an event occurred that would ultimately change the course of medical/dental science forever.

That night, when Dr. William Conrad Roentgen, a physics professor at the Julius Maximilian University in Wurtenburg, Germany, was closing down his laboratory for the evening, he noticed a strange glow emanating from a distant table.

It was a puzzle. He had been conducting experiments with electrical discharges in vacuum tubes, and he knew their gaseous contents would fluoresce, but wasn't convinced that this was the cause of the glow coming from the table.

Dr. Roentgen observed that there were no visible leaks around the protective covering of the vacuum tube, and that the fluorescence came and went as the power source was turned off and on. Curious, he found the glow came from a fluorescent screen that just happened to be covered with barium platinocyanide. Surely there was a connection.

Like most serendipitous events, it took more than good luck for the chance occurrence in Dr. Roentgen's lab to be developed into a new technology that would benefit all mankind. Radiographs were really the culmination of the ongoing investigation and experimenta-



*Dr. Wilhelm Conrad Roentgen,
1845-1923*

tion conducted by dedicated scientists down through the years. In fact, their origins may go back to as early as 1821, when Michael Faraday conducted his electric spark discharge experiments in partially evacuated glass vessels. Or even further. The vacuum Faraday used for his research was developed by Otto von Guericke in the mid 17th century.

Faraday's eventual description of electromagnetic induction was the source of the principle on which modern transformers depend. It was these scientific endeavors, and others by Crookes, Tesla and Ruhmkorff, that created the vacuum tubes, high-tension coils and high voltage generators

that enabled physicists in numerous laboratories in Europe and North America to experiment with gaseous discharges and fluorescence in evacuated tubes, and the discovery of radiation.

Joseph Jourbert, the 18th century French moralist, wisely stated, "Chance generally favors the prudent." And it was the prudent, dedicated and disciplined Roentgen, who turned the serendipitous discovery of a strange glow to mankind's advantage.

Whether it was from a desire to explore the unknown, or an inner sense that the glow he had seen was vitally important, Roentgen worked feverishly in his laboratory studying its strange properties. He called the emanations "X-rays" because of their unknown nature.

Roentgen soon discovered that his X-rays could penetrate through matter. For weeks he experimented with different objects, discovering that the rays would penetrate some objects more than others. He found that the denser an object was, the more precisely its image could be captured on a photographic plate.

Then, on one momentous day, he unintentionally placed his hand between the tube and the fluorescent screen he was working with, and saw what no one had ever seen before. The faint image of living bone. It was the beginning of radiology.

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Dr. Roentgen's Laboratory, Wurtenburg, Germany (photo courtesy of Eastman Kodak)

On December 20, 1895, Roentgen published his first paper, "On a New Kind of Ray, A Preliminary Communication." It was followed quickly by two successive papers within a year and a half, which reported on his complete experiments to date. For the next 15 years, his investigations proved to be so complete that, apart from X-rays being polarized and diffracted, no new knowledge was imparted.

Roentgen was awarded the Nobel Prize in 1901, the first time it was presented for physics. Refusing to seek patents for his work, he never gained financially from any of his discoveries. He believed his work belonged to mankind and even donated his Nobel Prize money to the University in Wurtenburg. In the end, the financial collapse of Germany following the First World War left Roentgen a poor man. He died from cancer in 1923 at age 78.

The first dental X-rays were taken by professor Wilhelm Koenig in Frankfurt, Germany, just two weeks after Roentgen's first publication. Two months later, in February 1896, a dentist in Brunschweig, Dr. Otto Walkhoff, coaxed a university professor to have X-rays made of his teeth. The exposure lasted more than 25 minutes. It took just two more months for the new technology to reach across the Atlantic. The first dental X-rays reported in North America were taken using a dried skull in April 1896 by physician/anato-

mist, Dr. William J. Morton, the son of Dr. William T.G. Morton, the dentist who discovered ether anesthetic.

Dr. Edmund Kells

Some of the first and most significant early contributions to radiology in North America were brought about by the genius of Dr. Edmund Kells of New Orleans, Louisiana. By the time Roentgen's discovery was made, Kells had already drawn worldwide attention for his work to introduce electrical applications to dental practice — his office was the first in the world to be fully electrified. In an 1888 article in *Dental Review*, Kells described a compressed air system, an electrically-driven handpiece and the world's first suction device.

It didn't take long for Kells to build his own X-ray apparatus and devise a radiographing technique for the proper exposure of the jaws and teeth. Kells' 1899 article in *Dental Cosmos* was the first to demonstrate the importance of keeping the film and object at right angles to the source of the X-rays when using a film holder. In July 1896, he gave the first demonstration on the use of X-ray equipment to a dental association in North Carolina.

Unfortunately, Dr. Kells also became one of the first martyrs of X-ray research. Years of experimentation, exposure and the holding of film caused radiation neoplasia on the fingers of his right hand. Pro-

gressively, the necrosis led to his fingers, hand and arm being amputated in a series of 42 operations. In May, 1928, at 72, tormented by pain and a lingering death, he ended his own life with a gun shot. To dentistry, his legacy and contribution have endured to benefit countless millions.

Film and Technical Development

Although George Eastman had developed the first roll film in 1888, radiography was initially accomplished with direct exposure on sensitized glass plates. However, within a year of Roentgen's 1896 discovery of X-rays, Eastman's company rose to the challenge and introduced the first sensitized paper designed for X-ray exposure. In 1913 it went one step further, by introducing a hand-wrapped, moisture-proof X-ray dental film packet, and a new film emulsion that was more sensitive than anything dentistry had seen before.

Eastman's next major milestone occurred in 1918, when his company introduced an X-ray film that had a high-speed emulsion coated on both sides of the support. This permitted the use of two intensifying screens, which further reduced exposure time.

At the same time as Eastman was perfecting his X-ray film, the first big "breakthrough" in radiology took place. In 1913 William Coolidge, director of research at General Electric, patented the hot cathode tube that bears his name. The design of the Coolidge tube kept the inner vacuum as low as possible and brought much greater control to the quantity and hardness of the X-ray beam, which could now be independently controlled. In 1919 Coolidge and GE made further improvements, by placing the tube and high-voltage components in an oil-filled grounded compartment that acted as a radiation shield.

There were also advancements taking place in the area of dental radiology education. The credit belongs to Dr. Howard Riley Raper, a part-time instructor at Indiana Dental College. Early on in

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the days of radiology, Raper coaxed his dean to purchase an X-ray machine and in 1909 he introduced the first course in radiology to a dental faculty curriculum.

In 1916 Raper produced the first text on radiology, *Elementary and Dental Radiology*, and in 1918 he developed the theory of an angle meter to reduce radiation distortion. Perhaps one of Raper's best known contributions was the technique to detect interproximal caries — the bite-wing.

Another milestone occurred in 1937, when Donald McCormack published a paper that explained the advantages of the long distance parallelizing technique over the bisecting-angle technique in minimizing anatomic distortion. But it took until the late 1940s before Dr. Gordon Fitzgerald developed a long cone for a dental X-ray machine.

The next significant step forward for dental radiology took place in the 1960s with the development of the panoramic machine — the S.S. White Panorex.

Canadian Pioneers: The Price Brothers

Frank Price and his brother Weston were the sons of Empire Loyalist pioneers who settled in the Napanee, Ontario area. Frank graduated from Trinity College in Toronto before becoming one of the first graduates of the Royal College of Dental Surgeons (RCDS). He ultimately practised in Toronto for over 45 years.

Shortly after graduation, Frank was appointed to the staff of RCDS as an instructor, and later as professor of electro-therapeutics. Weston, the younger brother, also a dentist, settled in Cleveland, Ohio, where he began a dental manufacturing business and earned world acclaim as a researcher and lecturer.

Before the turn of the century, both brothers became keenly in-



An artist's rendition of Dr. Kell's dental office at the turn of the century (photo courtesy of the Dental Economics Collector Series)

terested in the role of electricity in the dental office. As early as 1893, Dr. Frank Price was lecturing to Toronto dentists on the benefits of the new energy derived from electricity. Based on the minutes of one of his lectures, it would seem Dr. Price was ahead of his times: "Evidently, the members did not think electricity had much connection with the practise of dentistry. The members did not seem to be very well-up on the subject and there was little discussion."

This did not deter the Price brothers. Between them, they developed controlled heaters for air, water and wax; an electric cautery, pulp tester and sterilizer; an operating lamp for the forehead, a porcelain oven and a handpiece attachment that threw a stream of warm air and light into a cavity.

As early as 1897, they also earned fame for their development of the flexible leaded rubber used in X-ray gloves and protective aprons.

In January 1901 the *Dominion Dental Journal* reported that a "Roentgen-ray apparatus had been recently added to the equipment of the Dental College in Toronto

and the Board of the RCDS very promptly supplied an X-ray outfit as soon as its usefulness in dentistry was established." With credit to Drs. Frank and Weston Price, it was the first X-ray unit in Canada.

Another *Dominion Dental Journal* article reports on a lecture by Dr. Weston Price to the Toronto Dental Society on February 25, 1901. Complete with 31 radiographs projected on a "lantern slide," the lecture is a classic in case presentation. Dr. Price's opening sentences attest to the progress that had been made in dental radiology in just the few short years since Roentgen published his first paper.

"The great progress in the development of the science of dental skiagraphy in the past two years (i.e., 1889-1900) is little less than marvellous, for the pictures we made then as our best would now be considered utter failures. Then we were content to get an outline of the root of a tooth; now we study the pathological conditions of the pericemental membrane and abnormal growths in the pulp chamber."

Our Thanks

Radiology is 100 years old this month, but it has only achieved stature and importance through the efforts, endeavors, energy and sacrifices of determined men and women of vision from many years ago. Every dental health care worker in the world owes an inestimable debt to these pioneers. ■

Acknowledgement: Thanks to historians Dr. D.W. Gullett (*A History of Dentistry in Canada*) and Dr. M.D.K. Bremner (*The Story of Dentistry*) for their insight into things past, and to the wise editors of the *Dominion Dental Journal*, who recorded the events of the day at the turn of the century. Thanks also to Dr. Paul Goaz and Dr. Stuart White for their detailed outline on the origins of radiology, as reported in their text *Oral Radiology, Principles and Interpretation*.

RADIOLOGY



Surface and Internal Absorbed Doses In Mandibular and Maxillary Occlusal Radiography

Stephen F. Roth

Richard N. Bohay, DMD, M.Sc., MRCD(C)

Robin B. Barnett, PhD

ABSTRACT

The objective of this study was to determine the absorbed radiation doses to various structures within the head and neck as a result of routine mandibular and maxillary occlusal radiography. Five projections were investigated: the anterior mandibular; true mandibular; anterior maxillary; lateral maxillary; and maxillary vertex occlusal radiographic views. Standard thermoluminescent dosimetry methodology was employed using a humanoid phantom of the skull. Multiple exposures were done for each view to ensure adequate precision. The absorbed doses to various locations following a single occlusal exposure are presented in centigray (cGy). It was found that the absorbed dose values for occlusal radiography observed in this study were similar in magnitude to previously reported absorbed dose values for other forms of dental radiography. Values ranged from 0.0014 cGy to 1.301 cGy. The highest absorbed doses were generally the skin entrance doses. The results of this study provide an accurate, concise summary of surface and internal absorbed radiation doses for five commonly used occlusal radiographs. They can be used in the

calculation of risk estimates for dental radiography, and may assist dentists in their discussions with patients concerned about radiation exposure.

Key words: Dosimetry, dental, occlusal, radiography

SOMMAIRE

Cette étude avait pour but de déterminer les doses de radiations absorbées par les différentes structures de la tête et du cou lorsque des radiographies de l'occlusion mandibulaire et maxillaire sont prises régulièrement. On a étudié cinq points de projection en position occlusale : la mandibule antérieure, la mandibule vraie, le maxillaire antérieur, le maxillaire latéral et le vertex maxillaire. On a eu recours à la méthodologie dosimétrique thermoluminescente standard en utilisant un fantôme humanoïde du crâne. Les doses absorbées aux différents points après une seule exposition occlusale sont exprimées en centigray (cGy). On a découvert que les doses relevées étaient de même ampleur que celles qui ont été signalées pour d'autres radiographies dentaires. Les valeurs variaient de 0,0014 cGy à 1,301 cGy. En général, les doses les plus

élevées se trouvaient à l'entrée de la peau. Les résultats de cette étude constituent un résumé concis et précis des doses de radiations absorbées à la surface et à l'intérieur des cinq points d'occlusion ordinairement radiographiés. Ils peuvent servir pour calculer les risques des radiographies dentaires et être utiles aux dentistes ayant des patients qui s'inquiètent des dangers des radiations.

Mots clés : Dosimétrie, dentisterie, occlusion, radiographie.

Introduction

Radiographs have proven to be an invaluable diagnostic aid in dentistry. The ionizing radiation used in the production of radiographs is potentially damaging to biologic tissues, however, and may induce both somatic and hereditary changes. Estimates of the risk associated with the use of ionizing radiation in diagnostic radiology are calculated using the measured absorbed dose of exposed tissues. The absorbed doses to the various tissues associated with bitewing, periapical and panoramic dental radiography are well reported in recent literature.¹⁻¹²

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Table I

Mean Absorbed Dose For a Single Exposure In cGy $\pm$ s.e. For Internal Locations

Tissue	Occlusal Projection				
	Anterior Mandibular	True Mandibular	Anterior Maxillary	Left Lateral Maxillary	Maxillary Vertex
Frontal Bone Marrow	0.0034 $\pm$ 0.0004	0.0024 $\pm$ 0.0003	0.0394 $\pm$ 0.0022	0.0033 $\pm$ 0.0006	0.1706 $\pm$ 0.0026
Right Eye	0.0068 $\pm$ 0.0009	0.0023 $\pm$ 0.0001	0.0203 $\pm$ 0.0055	0.0022 $\pm$ 0.0004	0.0845 $\pm$ 0.0043
Left Eye	0.0272 $\pm$ 0.0021	0.0021 $\pm$ 0.0002	0.0883 $\pm$ 0.0030	0.1146 $\pm$ 0.0031	0.0874 $\pm$ 0.0014
Pituitary Gland	0.0032 $\pm$ 0.0003	0.0016 $\pm$ 0.0002	0.0019 $\pm$ 0.0001	0.0022 $\pm$ 0.0002	0.0353 $\pm$ 0.0045
Maxillary Bone Marrow	0.0123 $\pm$ 0.0011	0.0052 $\pm$ 0.0006	0.0572 $\pm$ 0.0006	0.0266 $\pm$ 0.0058	0.0385 $\pm$ 0.0002
Left Parotid Gland	0.0022 $\pm$ 0.0001	0.0014 $\pm$ 0.0001	0.0015 $\pm$ 0.0002	0.0025 $\pm$ 0.0002	0.0043 $\pm$ 0.0001
Tongue	0.0712 $\pm$ 0.0023	0.0883 $\pm$ 0.0028	0.0055 $\pm$ 0.0001	0.0064 $\pm$ 0.0004	0.0062 $\pm$ 0.0008
Mandibular Bone Marrow	0.0512 $\pm$ 0.0004	0.0627 $\pm$ 0.0019	0.0078 $\pm$ 0.0001	0.0193 $\pm$ 0.0020	0.0047 $\pm$ 0.0001
Anterior Sublingual Region	0.1362 $\pm$ 0.0008	0.1580 $\pm$ 0.0079	0.0044 $\pm$ 0.0002	0.0053 $\pm$ 0.0005	0.0053 $\pm$ 0.0005
Left Submandibular Region	0.0286 $\pm$ 0.0007	0.0542 $\pm$ 0.0116	0.0026 $\pm$ 0.0002	0.0077 $\pm$ 0.0002	0.0072 $\pm$ 0.0006
Right Thyroid Gland	0.0022 $\pm$ 0.0002	0.0029 $\pm$ 0.0000	0.0014 $\pm$ 0.0003	0.0015 $\pm$ 0.0000	0.0032 $\pm$ 0.0002
Left Thyroid Gland	0.0022 $\pm$ 0.0000	0.0032 $\pm$ 0.0000	0.0017 $\pm$ 0.0003	0.0028 $\pm$ 0.0010	0.0030 $\pm$ 0.0005

Occlusal radiography was described as early as 1930,¹³ but few studies have considered the absorbed doses associated with standard occlusal radiographic projections. Two studies by Berge and Wohni^{14,15} examined the absorbed doses associated with four maxillary occlusal projections. Bankvall and Hakansson¹⁶ reported on the absorbed doses associated with the maxillary frontal occlusal view in child patients. An older study by Antoku et al¹⁷ reported on absorbed doses to four sites associated with occlusal views of the upper incisors, upper cuspids, floor of the mouth and lower third molars. However, reports investigating the absorbed doses associated with occlusal projections using E-speed film are lacking.

The purpose of this study was to determine the absorbed radiation doses of various head and neck structures during routine mandibular

and maxillary occlusal radiography, using current radiographic techniques.

Materials and Methods

Radiographic Views

Five projections, including the anterior mandibular, true mandibular, anterior maxillary, lateral maxillary and maxillary vertex occlusal views, were studied. Care was taken to follow the radiographic techniques described by Goaz and White¹⁸ and Smith¹⁹ with respect to the relationship of the X-ray beam, X-ray film and patient position. In all projections, the film was placed along the occlusal plane and the central ray was aimed toward the centre of the film. For the anterior mandibular view, the beam was centred along the mid-sagittal plane and angled 55 degrees to the plane of the film. Similarly, for the true mandibular occlusal view, the pa-

tient's head was tipped back and the beam was directed perpendicular to the film. The central ray was projected through the mid-sagittal plane for this view. In the anterior maxillary occlusal view, the beam was directed through the mid-sagittal plane at a 65 degree angle to the plane of the film. For a lateral maxillary projection, the film was placed with the edge parallel to the buccal surfaces of the remaining teeth, and the central ray was angled 65 degrees to the plane of the film and directed to the centre of the film through a point 2.0 cm below the lateral canthus of the eye. The maxillary vertex projection images the upper teeth down their long axis. For this view, the beam was angled 75 degrees to the plane of the film and aimed through the anterior cranium toward the middle of the film.

Prior to completing the experimental exposures, radiographs were exposed to ensure proper im-

Table II

Mean Absorbed Dose For a Single Exposure In cGy $\pm$ s.e. For Surface Locations

Location	Occlusal Projection				
	Anterior Mandibular	True Mandibular	Anterior Maxillary	Left Lateral Maxillary	Maxillary Vertex
Entrance Point of Central Ray	0.1932 $\pm$ 0.0014	0.2444 $\pm$ 0.0104	0.1876 $\pm$ 0.0012	0.1970 $\pm$ 0.0044	1.3010 $\pm$ 0.0006
Right Supraorbital	0.0025 $\pm$ 0.0001	0.0127 $\pm$ 0.0026	0.0178 $\pm$ 0.0046	0.0018 $\pm$ 0.0003	0.0037 $\pm$ 0.0019
Left Supraorbital	0.0028 $\pm$ 0.0002	0.0061 $\pm$ 0.0007	0.1152 $\pm$ 0.0022	0.2389 $\pm$ 0.0023	0.0420 $\pm$ 0.0021
Nasion	0.0042 $\pm$ 0.0002	0.0023 $\pm$ 0.0003	0.1880 $\pm$ 0.0013	0.0200 $\pm$ 0.0096	0.1181 $\pm$ 0.0088
Right Infraorbital	0.0032 $\pm$ 0.0003	0.0127 $\pm$ 0.0012	0.1134 $\pm$ 0.0021	0.0027 $\pm$ 0.0006	0.0294 $\pm$ 0.0027
Left Infraorbital	0.0092 $\pm$ 0.0011	0.0086 $\pm$ 0.0008	0.1747 $\pm$ 0.0003	0.2096 $\pm$ 0.0032	0.0506 $\pm$ 0.0024
Right Cheek	0.0336 $\pm$ 0.0043	0.0092 $\pm$ 0.0019	0.0675 $\pm$ 0.0051	0.0020 $\pm$ 0.0008	0.0098 $\pm$ 0.0000
Left Cheek	0.0606 $\pm$ 0.0054	0.0301 $\pm$ 0.0111	0.1072 $\pm$ 0.0132	0.1600 $\pm$ 0.0031	0.0066 $\pm$ 0.0001
Philtrum	0.1514 $\pm$ 0.0008	0.1197 $\pm$ 0.0068	0.0732 $\pm$ 0.0007	0.0859 $\pm$ 0.0002	0.0251 $\pm$ 0.0018
Lower Lip	0.1809 $\pm$ 0.0025	0.1920 $\pm$ 0.0096	0.0660 $\pm$ 0.0002	0.0141 $\pm$ 0.0007	0.0035 $\pm$ 0.0003
Menton	0.2037 $\pm$ 0.0020	0.2248 $\pm$ 0.0094	0.1050 $\pm$ 0.0014	0.0862 $\pm$ 0.0004	0.0031 $\pm$ 0.0001

age geometry and film density for each view. These relationships were kept constant and reproducible throughout the study.

Phantom

A RANDO Average Man Phantom (Alderson Research Laboratories, Inc., Stamford, Connecticut)^{20,21} was used for all exposures. This humanoid phantom consists of a human skull, teeth and torso embedded in isocyanate rubber, which has an effective atomic number of 7.30 ± 0.25 per cent and a specific gravity of 0.985 ± 1.25 per cent.²² The phantom has air-filled spaces representing the pharynx, trachea, and maxillary sinuses, and is divided into 24, 2.5-cm thick horizontal sections. The top nine sections were used in this study, and the occlusal film was placed between sections five and six, as this position most closely represented the occlusal plane.

Symmetrically positioned holes are present in each section of the phantom, into which a thermoluminescent dosimetry (TLD) rod can be placed. Holes situated at the approximate anatomic locations of various structures of interest were identified in various sec-

tions of the phantom. These holes were fitted with a polystyrene tube that would allow reproducible placement of the TLD rod for the duration of the study. As well, the same TLD rod was used in the same phantom location throughout the experiment. Unused holes were filled with plugs made of tissue-equivalent material. At the surface sites, a polystyrene tube was taped to the phantom to allow reproducible placement of the TLD rod.

X-ray Equipment

The X-ray unit used was a GE model 11CE8A (General Electric Co., Milwaukee, Wis.). The aiming device attached to the X-ray tube was an open-ended cylinder 2.5 inches in diameter. The distance from the anode to the end of the cylinder was 18 inches. Total filtration equalled 2.7 mm of aluminum. The exposure settings for the maxillary vertex view were 3.0 seconds, 80 kVp and 10 mA. For all other views, the settings were 1.0 second, 65 kVp and 10 mA. Ektaspeed (Eastman Kodak Co., Rochester, N.Y.) occlusal size films were used throughout the study.

Thermoluminescent Dosimetry Rods

Absorbed doses were measured using individually calibrated, LiF:Mg:Ti TLD rods (Harshaw Chemical Co., Solon, Ohio) measuring 1x1x5 mm. These rods have a density of 2.64 g/cm³ and an effective atomic number of 8.2. Their suitability for this type of research has been shown by McKinlay.²³

Prior to exposure, the TLD rods were annealed at 400°C for one hour and then at 100°C for two hours. The TLD rods were then placed into polystyrene cylinders, inserted into the phantom at their assigned locations, and exposed. One TLD rod was placed at the end of the cylinder in order to obtain a measure of relative output for that exposure. Two unexposed TLD rods were used to measure background radiation. The TLD rods were handled with plastic coated tweezers to avoid scratching the crystal surface. Following exposure, the TLD rods were subjected to a pre-read annealing at 100°C for 10 minutes. They were then read in a Harshaw/Filtrol model 2000D automated TL Analyzer system with a Harshaw

model 2080 TL picoprocessor. This system uses hot nitrogen gas to heat the dosimeters to 320°C in 10 seconds. The high voltage supplied to the TLD detector was set at 710 V. System tests of the light source and background tests of an empty dosimeter well were performed before and after each set of readings.

Two sets of TLD measurements were obtained for each radiographic view. Each set consisted of 30 exposures, except for the maxillary vertex view, for which 10 exposures were obtained. Multiple exposures were required to generate sufficient precision.

Ionization Chamber and Electrometer

Exposure measurements were made at the end of the plastic aiming cylinder using a Capintec PM-05 (5.0 mL) ionization chamber and a Capintec 192 electrometer. This measuring system was cross calibrated with a separate 0.5 mL ionization chamber, and electrometer calibrated for exposure by the National Research Council in Ottawa.

Calculation of Absorbed Dose

The absorbed dose in tissue was determined using the formula: $Dose_{tissue} = X_{phantom} * f_{tissue}$, where $X_{phantom}$ is the exposure to the phantom and f_{tissue} is the roentgen to cGy conversion factor.²⁴ In this study, a mean value for f_{tissue} of 0.92 was used, corresponding to an effective photon energy range of 10 to 80 keV.

The exposure to the phantom was determined using the formula: $X_{phantom} = (TLD_{phantom}/TLD_{reference}) * X_{reference}$, where $TLD_{phantom}$ is the TLD reading from the experimental location, $TLD_{reference}$ is the TLD reading from the end of the aiming cylinder, and $X_{reference}$ is the exposure at the end of the aiming cylinder, measured using the ionization chamber and electrometer. By combining these two equations, it can be determined that: $Dose_{tissue} = (TLD_{phantom}/TLD_{reference}) * X_{reference} * f_{tissue}$.

In these equations, it is assumed that charged particle equilibrium existed at all measurement locations, and that the relative re-

sponse of the TLD rods was constant for an effective photon energy range of 10 to 80 keV.

Results

The results are presented in **Tables I and II**. **Table I** shows the mean absorbed dose to internal structures for a single exposure for each of the occlusal projections in centiGray. Values are given for 11 internal head and neck structures. **Table II** shows the mean absorbed dose in cGy to locations on the skin surface for a single exposure for each of the occlusal projections. Eleven locations are described, including the dose at the point of entry of the central ray.

In general, surface absorbed doses were found to be slightly larger than internal absorbed doses. The largest doses were usually associated with the point of entry of the central ray, and with areas on the skin in the radiation beam. For the maxillary vertex projection, the entrance absorbed dose was 1.301 cGy. For the other four occlusal projections, the entrance absorbed doses ranged from 0.1876 cGy to 0.2444 cGy. The remainder of the surface absorbed doses followed an expected pattern, rapidly diminishing with increasing distance from the path of the radiation beam. The lowest surface absorbed dose was 0.0018 cGy. This was associated with the right supraorbital region during a left lateral maxillary projection.

Internal absorbed doses also followed an expected pattern. The absorbed dose generally diminished with depth of the tissue and the distance from the path of the radiation beam. Absorbed doses to the frontal, maxillary and mandibular bone marrows ranged from 0.0024 cGy to 0.1706 cGy. The largest bone marrow absorbed dose was associated with the frontal bone marrow during the maxillary vertex projection.

Absorbed doses to the thyroid region were consistently low for all of the standard occlusal radiographic projections. These values ranged from 0.0014 cGy to 0.0032 cGy.

The salivary gland region receiving the highest absorbed dose

was the sublingual region, which received 0.1580 cGy during the true mandibular occlusal projection. Doses to the parotid gland were consistently low for all standard occlusal projections (0.0014 cGy to 0.0043 cGy).

Ocular absorbed doses were found to vary greatly in this study. The range was from 0.0021 cGy to 0.1146 cGy.

Discussion

The results of this study show that the absorbed doses associated with mandibular and maxillary occlusal radiography are comparable in magnitude to those associated with other projections commonly used in the dental office. Although the risk to the patient from dental radiography is considered to be quite small, it cannot be assumed to be zero. White has estimated the total risk from dental radiography to be approximately 2.5 fatal malignancies per million full mouth examinations taken with D-speed film and round collimation.²⁵

Of the standard occlusal radiographic projections, the maxillary vertex view requires the highest exposure settings and results in the highest absorbed dose to some tissues, including the skin, frontal bone marrow and pituitary gland. During a maxillary vertex occlusal projection, the beam must pass through a significantly greater amount of tissue than for other occlusal projections. Thus, beam strength must be increased to ensure a properly exposed film.

This study found differences in the absorbed doses associated with some bilateral structures, specifically the right and left eyes, and the right and left supraorbital and infraorbital regions. These differences would be expected with the left lateral maxillary projection, but are unexpected in projections where the central ray is aimed parallel to the mid-sagittal plane. An explanation for these discrepancies may be the small differences in the distance between these bilateral sites and the midline of the phantom. This could result in one of the TLD rods being within the path of the radiation beam and the contralateral TLD rod being just

outside of the beam. The differences in absorbed dose between the right and left eyes for views in which the central ray was directed parallel to the mid-sagittal plane can be explained by the fact that the manufacturer's placement of the holes in the phantom was not exactly symmetrical.

The absorbed dose values reported for maxillary occlusal projections in this study are similar to those previously reported using D-speed film. Berge and Wohni¹⁴ reported values ranging from 0.0013 cGy (parotid gland) to 0.1364 cGy (left eye lens) for the maxillary vertex projection, using exposure factors of 90 kV, 27 mAs and 1.8 seconds. For the anterior maxillary view, they reported values ranging from 0.0002 cGy (parotid gland) to 0.2358 cGy (right eye lens). Absorbed dose values reported by Bankvall and Hakansson¹⁶ for the anterior maxillary view in children ranged from zero (parotid gland) to 0.5450 cGy (tip of the nose).

The differences between the results from previously reported dosimetry studies and those reported in this paper likely reflect variations in the phantoms, TLD sites, X-ray generators, radiographic techniques and the dosimetric systems used.

Variance in the absorbed dose measurements in this study can be explained by the dosimeters placed near the edge of the beam, where there is a large dose gradient, as well as by variability in the output of the X-ray unit and small day-to-day variations in beam positioning.

Conclusions

This paper presents the absorbed radiation dose to various head and neck structures as a result of routine mandibular and maxillary occlusal radiography. The absorbed dose values were found to be similar to previously reported values using D-speed film, and were comparable to the absorbed doses associated with other forms of dental radiography. These values can be used to estimate the risk to dental patients as a result of occlusal radiography, and may be helpful to dentists in their

discussions with patients concerned about radiation exposure from occlusal radiography. ■

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Mr. Roth is a dental student at the University of Western Ontario.

Dr. Bohay is an assistant professor of oral radiology, faculty of dentistry, University of Western Ontario.

Dr. Barnett is senior physicist at the London Regional Cancer Centre.

Reprint requests to: Dr. Richard N. Bohay, Department of Oral Radiology, Faculty of Dentistry, The University of Western Ontario, London, ON N6A 5C1.

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RADIOLOGY



Digital Dental Imaging Systems: A Review

Dónal McDonnell, BDS, FFDRCSI, M.Sc.

Except for the development of faster film emulsions and improvements in X-ray apparatus and safety precautions, the production of intraoral radiographs has remained largely unchanged since Wilhelm Roentgen discovered X-rays in 1895.

Intraoral radiographic images are still produced by placing radiographic film in a patient's mouth and exposing both the patient and the film to ionizing radiation. The resultant image becomes visible after chemical processing. Likewise, the radiographic appearance of the common conditions observed on intraoral radiographs has not changed.

Recently, however, digital imaging techniques — computerized tomography, magnetic resonance and isotope scanning — have improved the visualization of conditions that affect the jaws. Increasing computerization suggests that the paperless, and indeed the filmless, dental office is getting closer.

Computer-based digital dental imaging systems, first introduced in the late 1980s, involve the placement of a sensor in the patient's mouth instead of radiographic film. The patient is exposed to radiation as before, but the resultant image is displayed, almost instantaneously, on a computer screen. Images obtained in this way can be saved and stored in the computer, although paper printouts are available if required.

RadioVisioGraphy or RVG (Trophy Radiologie, Vincennes, France) was the first digital imaging system to be introduced.^{1,2} Since then, many other digital systems have been developed.³⁻⁹ In fact, new systems are being introduced almost continuously and older systems are being updated.

The physical set-up of a typical digital imaging system is illustrated in Fig. 1, along with some examples of images acquired with the Sens-A-Ray system (Regam Medical Systems, Sundsvall, Sweden) illustrated in Fig. 2.

Presently, three sensor types are available: a charge-coupled device (CCD), an intensifying screen focused on a CCD, and a phosphor plate. Of the three types, the CCD is most commonly used. It consists of a two-dimensional array of pixels, where each pixel acts as a small capacitor that's able to store an electrical charge when exposed to X-rays or light. This charge is amplified and converted by computer hardware and software, which then transfers, via a frame grabber, the resulting signal to a graphics program for display. The computer displays the image on a 256 grey shade scale, although the human eye can only appreciate 32 grey shades.¹⁰

Sens-A-Ray and Visualix (Gendex Dental Systems, Monza, Italy) use a CCD exposed directly to radiation while others incorporate an intensifying screen which pro-

duces light when exposed to radiation. To transfer this light to the CCD, RVG systems use optical fibres, whereas the Flash Dent (Villa Sistemi Medicali, Buccinasco, Italy)⁵ system uses a combination of seven lenses.

The recently described Digora system (Soredex Orion Corporation, Helsinki, Finland) uses a phosphor plate sensor. When this sensor is laser scanned, it releases the stored X-ray energy as visible light. The resulting image is then viewed on a computer screen.⁹

Most of the systems available today can be used with an existing dental X-ray unit, provided that its timing device is electronic. These systems may also be connected to existing practice computer systems, so that all relevant patient information is stored in one data bank. Expert computer advice may be required to achieve this connection, however, depending on the type of computer software in use. Video images may also be incorporated into the system, thereby allowing all patient information to be stored in one source.

The major advantages of digital systems include the instantaneous image, the elimination of processing, and the significant reduction in radiation exposure. The radiation doses produced by most digital systems are actually 20 to 40 per cent less than the doses pro-

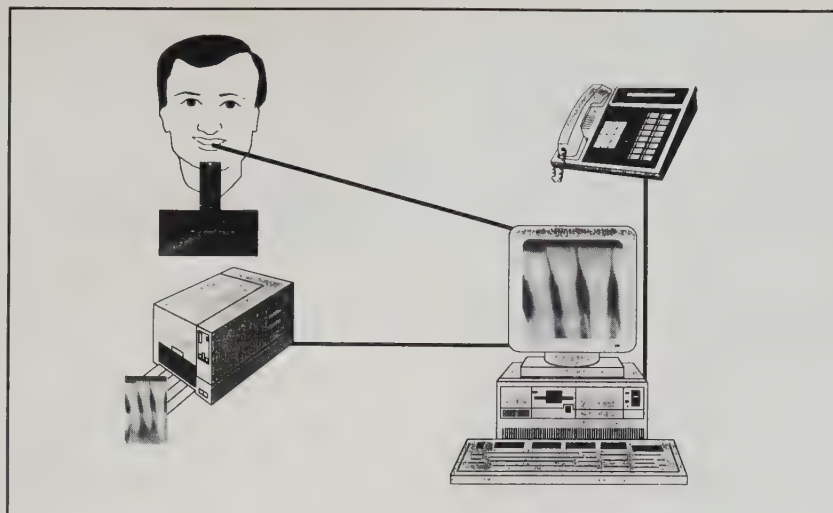


Fig. 1: The diagram illustrates digital image acquisition obtained by placing a CCD in a patient's mouth. Information is transferred to a computer for processing and display. A paper print out is also available, and the image may be transmitted elsewhere via electronic mail.

duced by E-speed radiographic film,^{11,12} and Digora apparently offers 80 per cent dose reduction.¹³

Once the digital image is acquired, it can be manipulated by altering the contrast and brightness. It is also possible to enlarge part of the image, and make linear and angular measurements. The instantaneous image reduces chairside time, while the elimination of processing chemicals is very environmentally friendly. If larger images are required to demonstrate the anatomy — e.g. size 2 occlusals or panoramics — then conventional film and processing will still be required.

The ability to send radiographic images to third-party insurers for prior approval or to specialists for an opinion via electronic mail, and to receive comments back by telephone or electronic mail the same or next day, will speed up the delivery of treatment to patients. Furthermore, the use of digital information, including radiographic images, may also be an asset in forensic odontology, where large distances can be crossed very quickly by the use of teleradiology.¹⁴ The problem of confirming that the transmitted image is the original and has not been modified may still present difficulties, however.

The major disadvantages of digital systems include the relatively small sensor size, equivalent to a size 0 radiographic film, and

the wire that attaches the sensor to the computer. Both the Digora and Schick systems (Schick Technologies Inc., Long Island City, N.Y., U.S.A.) offer three sensor sizes, allowing more of the anatomy to be visualized. The sensors are generally quite bulky compared to the thickness of existing film, so some difficulty may be encountered with sensor placement in small mouths. In addition, special sensor holding devices are required for sensor placement and to aid in the alignment of the X-ray beam. Another concern is that the teeth are separated by the diameter of the sensor wire during a bitewing examination, resulting in an absence of alveolar bone level on the resultant image. The Digora system is wireless. Systems with small sensor size will only permit single-tooth images (**Fig. 2**). Because multiple images are required for a complete mouth survey, this could negate the expected saving in radiation exposure by dramatically increasing the number of images required.

When digital systems are first introduced in the dental office, the retake incidence may be high due to difficulty in sensor placement and the small active sensor size. The visualization of the apices of long teeth, especially canines, may also be a problem (**Fig. 2**), but the different sensor sizes available with the Digora and Schick systems should overcome this. An-

other factor to consider is that the sensors are not heat sterilizable and require coverage with disposable plastic sleeves to prevent contamination. The design and adaptation of the sleeve to the wired sensor may also influence patient comfort in a small mouth with an already bulky sensor.

The storage and retrieval of images may also present a long-term problem, depending on the number of images per patient that the practice keeps on file. On average, four digital intraoral images require 1.0 megabyte of space to store. This means that large capacity disc drives will probably be required at the outset. Images may subsequently need to be removed to create space, however, so optical disc drives and magnetic tapes, with their larger capacity, will be an advantage. Image compression can also decrease the storage space requirement, and different techniques are available to do this.¹⁵ However, compression may result in information loss — some information is not retrievable when the image is decompressed — and this obviously has medico-legal implications.

If a digitally-acquired image is not satisfactory, it is not saved or stored and the patient is re-exposed to radiation to acquire a satisfactory image. There is, therefore, no record of the first exposure in the patient's clinical records.

It is also possible to export digital images into graphics programs and alter them. Artificial carious lesions can be created, restorations and root canal treatments can be graphically added, teeth can be extracted, and bone can be added to simulate healing. It can be difficult to detect whether an original image has been altered. This has implications in connection with fraud, i.e. receiving payment for treatment that was not actually carried out, as well as for forensic identification, i.e. when comparing post-mortem images with altered ante-mortem images.

In general, the resolution obtained with digital systems is not as good as the resolution seen in film-based images. Resolution can be measured by making images of a

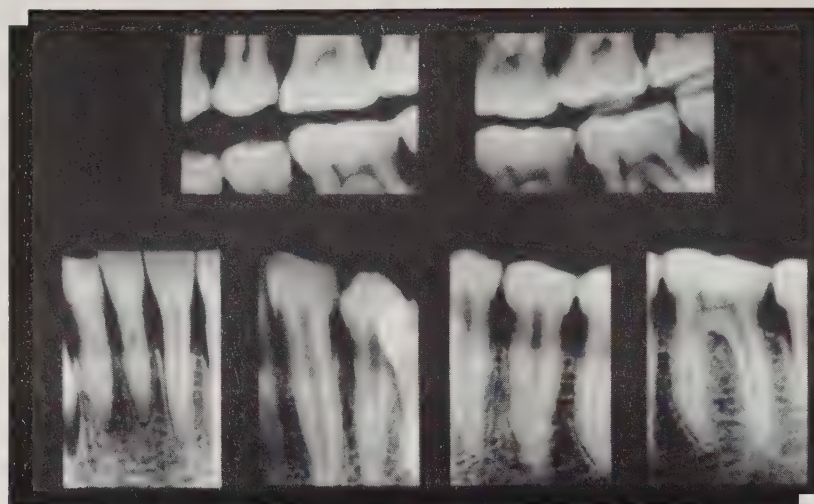


Fig. 2: Examples of periapical and bitewing radiographs illustrating single-tooth imaging of mandibular and maxillary teeth, difficulty in visualizing the full length of the canines, and the absence of alveolar bone on the bitewing examinations.

test object called a line pair plate, which consists of parallel bars of lead with spaces between them. The finer the resolution, the smaller the gap size that can be recorded between the bars. RVG can resolve about seven line pairs per mm,² whereas Sens-A-Ray can resolve about 10 line pairs per mm.^{3,4} D-speed radiographic film resolves in excess of 10 line pairs per mm.⁴

The poorer resolution obtained with digital imaging systems may cause difficulty in visualizing endodontic files smaller than size 15.¹⁶ This could effect endodontic therapy on sclerosed canals. However, digital systems seem to perform comparably to conventional film radiography for caries detection^{17,18} and assessment of periodontal bone lesions.¹⁹ While the resolution of the digital systems is inferior to that of film, it is probably adequate for the purposes intended, namely periodontal and periapical inflammatory disease detection, and caries.

Digital panoramic and cephalometric images are currently available, but the equipment required to produce them is very expensive. Computer technology continues to improve, however, and costs are coming down.

The advent of intraoral video cameras is changing the way dentists present treatment plans to patients. Computer images, both clinical and radiographic, help considerably in patient education.

A lot of research is currently ongoing in the field of digital imaging, which, in a few years, will result in the increased availability and use of digitally-acquired dental images. Clearly, dental radiography will undergo a major change over the next few years. ■

Dr. McDonnell is assistant professor, division of oral radiology, faculty of dentistry, University of British Columbia.

Reprint requests to: Dr. Dónal McDonnell, 2199 Wesbrook Mall, Vancouver, BC V6T 1Z3.

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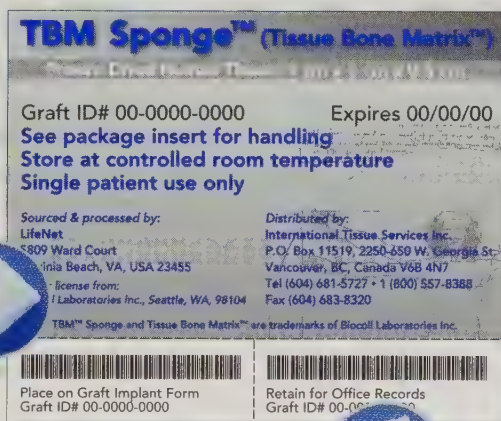
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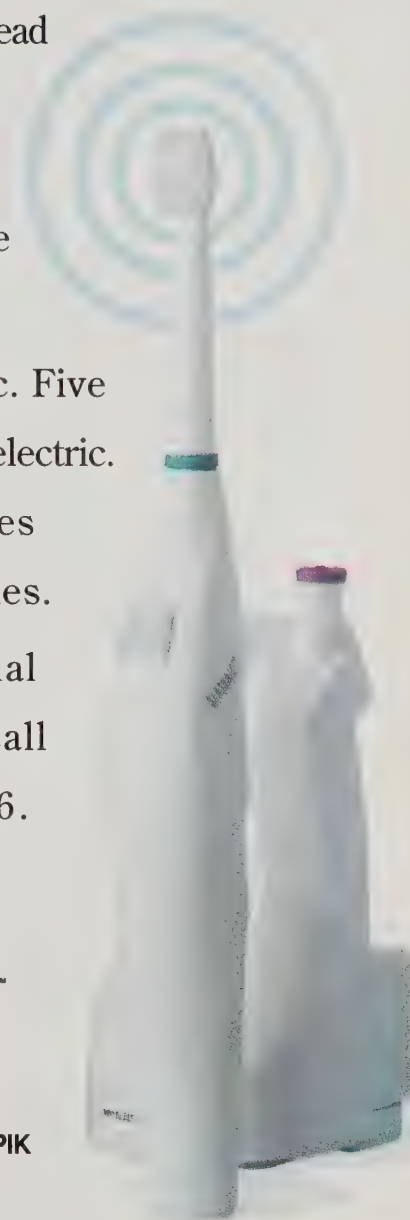
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Educational Use Of Indirect Digital Radiographic Imaging

M. Bourgeois, DDS, Dip. Oral Rad., M.Ed.

P. Sikorski, DDS, M.Sc.D., FRCD(C)

R.E. Wood, DDS, M.Sc., Dip. Oral Rad., FRCD(C)

Introduction

Digital imaging is a process in which transmitted light from a previously-recorded image or an X-ray beam is converted into an electronic signal, first in analog and then in digital form. The acquisition, storage, retrieval and display of this image is controlled — and made possible — with a computer.

The collection and conversion of X-rays into a computerized image is defined as direct digital imaging. Two examples of direct imaging systems are the Sens-A-Ray (Regam Medical Systems AB, Sundsvall, Sweden) and RadioVisioGraphy or RVG (Trophy Radiologie, Vincennes, France) units used for intraoral radiography.

Similarly, the conversion of a previously-recorded image into digital form is called indirect digital imaging. In this process, the initial image may be in one of several formats: a radiograph, a black and white photograph of a radiograph, or a 35 mm slide. It is then scanned into a computer, processed, and displayed on a monitor.

Once an image is digitized, either directly or indirectly, it can be stored, manipulated and output into one of several mediums: dedicated hard drive, floppy disc, CD-ROM, video charge-coupled device (CCD), photograph, or 35 mm slide. In dentistry, indirect digital imaging is currently used in

cephalometric film analysis, the transportation of images, slide production and forensics.¹ It has many other potential uses, however, particularly in education. The purpose of this paper is to elaborate on its application in this area.

In the conversion of an image from one medium to another — whether it be from radiographic film to 35 mm slide, original radiograph to duplicate radiograph, or radiograph to digital image — there is some loss of information. As a result, the overall quality of the digital image cannot be more than that of the input radiograph.² The essential educational advantage of the digital image is that it can be manipulated and displayed to direct the observer to a particular area of interest.

Image Manipulations

The intent of this section is to demonstrate how manipulation can be used to enhance or alter the structures observed in original radiographic film.

In Figs. 1 to 5, intraoral radiographs obtained from the archival collections of the University of Toronto's department of oral radiology were digitized on a Macintosh IIfx computer (Apple Computer, Cupertino, Calif., U.S.A.) using a flat-field X-ray scanner (XRS, model 3CX, Torrance, Calif., U.S.A.). Adobe Photoshop image-editing software (Adobe Systems, Mountain View, Calif., U.S.A.) was then used

to manipulate the digitized radiographic images. The Photoshop program is relatively inexpensive, commercially available, and can be run on a personal computer.

Subsequent to manipulation, the radiographic images were output to a digital film recorder (colorfast GCC corporation California).

Enhance Density and Contrast

One of the most basic manipulations is the enhancement of the image's density and contrast (Fig. 1). This manipulation cannot change a poor quality radiograph into an image with ideal density and contrast, but it can make minor improvements on the densitometric qualities of the original radiograph.³

In education, this manipulation is typically used to optimize the appearance of the specific structures you wish to draw attention to, even if these changes are at the expense of other structures. For example, the density and contrast may be altered to best demonstrate periapical bone disease, but caries detection may become difficult. Fig. 2 shows a digitized image which has density and contrast comparable to the original radiograph. In Fig. 3 the density and contrast of the mesial half of the image was enhanced to better demonstrate the periapical area of 24.

Label and Highlight

Digitized images may be labelled or highlighted to draw attention to an area of interest. La-

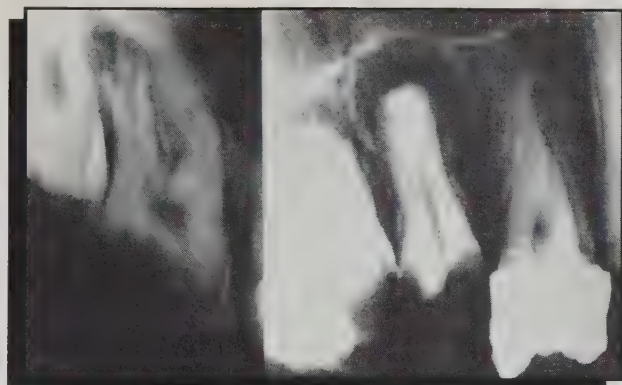


Fig. 1: This radiographic image has been manipulated to enhance its density and contrast.

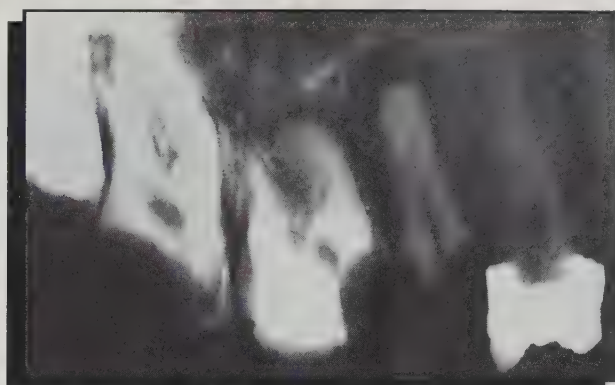


Fig. 2: A digitized image of the radiograph depicted in Fig. 1, but with density and contrast comparable to the original radiograph.

bellings markers can either be accessed from the computer software or scanned from another source and transported into the digitized image. An area of interest may also be highlighted by altering its density, contrast or brightness.

In **Fig. 4**, the letter "A" and the accompanying line extending to tooth 26, which demonstrates apical periostitis, were obtained through direct use of the software program. The letter "d" and the accompanying arrow to the zygomatic process of the maxillary bone are "Letraset" figures that were scanned into the computer from hard copy, and then transposed over the image. Also of note is the highlighting of the periapical rarefaction and root of tooth 25, which was achieved by altering the levels of grey within a circumscribed perimeter.

Delineate A Specific Area of Interest

A specific area of radiologic change can be delineated or outlined by simple computer manipulation. In **Fig. 5**, the antral floor was outlined, freehand, using a digitizing tablet, to show the loss of cortex secondary to the periapical infection at the buccal roots of tooth 26. The discontinuous line overlies the periostitis apical to the palatal root of tooth 26.

Alter the Original Image

In this manipulation, structures that were present in the original radiograph may be modified or even removed from the digitized film. As well, structures or abnormalities that were not present originally can be incorporated into the

new image. These alterations are made by drawing freehand over the digitized image, by transposing a part of the image from one area to another, and/or by transposing structures taken from another digitized film into the final image.

In **Fig. 6**, the original image was altered by "scribing-in" the root canal filling in tooth 24, internal root resorption of tooth 25, bone loss within the trifurcation of tooth 26 and a crown (with recurrent decay) on tooth 27. The root tip of the supplemental premolar, demonstrated between 24 and 25, is part of a premolar root that was transposed from another digitized film.

In contrast to the manipulations that serve to enhance perception of detail, this manipulation demands a high level of operator skill. The scope and complexity of the changes that can be made to a radiographic image are therefore dependant on the operator.

Because the modification of digitized images has the potential to enhance an observer's ability to detect information, it gives digital imaging an advantage over the conventional resource material currently used in education. Its versatility in output format also broadens its scope of application in education.

Applications in Education

1. Instructor-Assisted Study and Self-Study

The best conventional resource used in large-group teaching is a 35 mm slide generated by photographing a radiograph. The advantage of generating these slides using digital imaging is that the

resulting slides — whether through modifications in density, contrast or brightness, or through highlighting and labelling — take on a more instructional role, by helping to direct the observer or student to specific structures.

As seen in **Fig. 6**, the instructor has the ability to create or modify the severity of disease demonstrated in the radiographic image. Whereas the radiograph is static — capturing structures or diseases at a specific point in time — the instructor can use computer-generated digital images to show disease progression. In addition, for small-group or one-on-one clinical teaching, it is possible to work directly from a computer work station using scanned conventional radiographs alone.

The organization of digitized radiographs into data banks covering a variety of subjects or disease processes would have clear educational merit for both instructor-assisted and self study, however. In addition, using CD-ROM technology to provide programs or topics of study could be beneficial both within the university setting and for continuing education.

2. Student Testing

At the University of Toronto, didactic examinations in oral radiology currently include questions that require students to examine photographic sheets of radiographs. The process of creating these photographic sheets is labor-intensive for faculty, who must both build a collection of resource radiographs suitable for examination purposes, and mount and affix appropriate labels onto this film

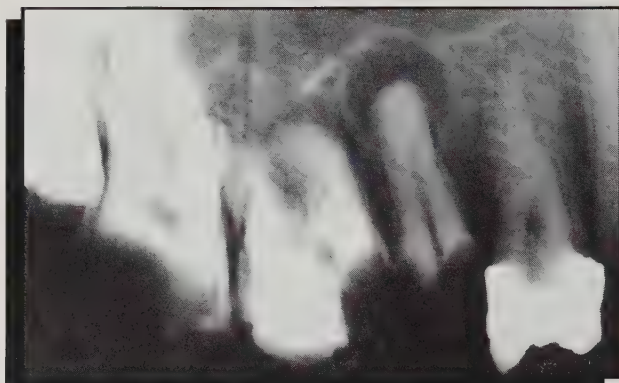


Fig. 3: The density and contrast of the mesial half of the image depicted in Fig. 1 was enhanced to better demonstrate the periapical area of tooth 24.

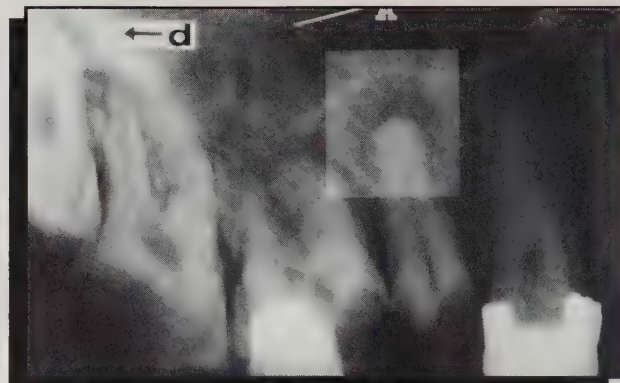


Fig. 4: The letter "A" and the accompanying line to tooth 26 were obtained using the digital imaging software program and inserted into the radiograph, while the letter "d" and the accompanying arrow are actually external "Letraset" characters that were scanned into the computer system prior to their insertion into the radiograph.

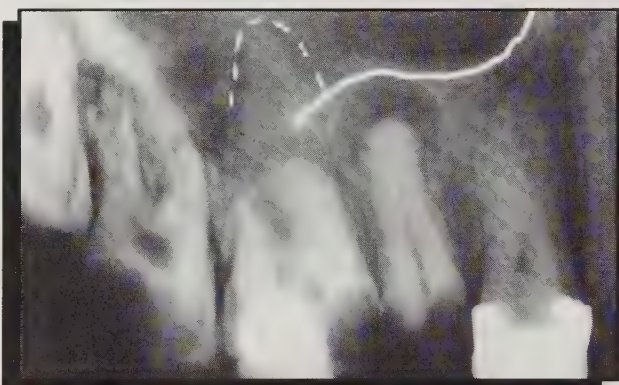


Fig. 5: In this image, the antral floor was outlined freehand by the operator, using a digitizing tablet, to show the loss of cortex secondary to the periapical infection at the buccal roots of tooth 26.

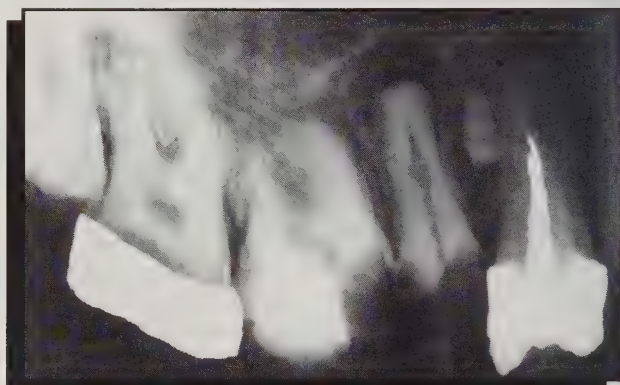


Fig. 6: The original image, as seen in Fig. 1, was altered by scribing-in the root canal filling in tooth 24, the internal root resorption of tooth 25, bone loss within the trifurcation of tooth 26, and a crown (with recurrent decay) on tooth 27. The root tip of the supplemental premolar demonstrated between teeth 24 and 25 is part of a premolar root that was transposed from another digitized film.

before it is photographed. With digitization, the labelling and alignment of film is simpler and faster. As well, a smaller collection of radiographs is needed, because each film may be manipulated to demonstrate disease processes that were not present on the original radiograph. Furthermore, because digitized films can be stored in their original form, they may be relabelled, altered and reused for different examinations.

3. Educational Research

Digital imaging, because it allows the operator to make controlled changes to an image and then reverse them, has particular application in research related to interpretive skills. In fact, it has already been applied in research to inves-

tigate the effect of restorations on caries detection.⁴

Similarly, in education, digital imaging can be used to research the impact that varying parameters of image quality (e.g. density, contrast) have on the students' acquisition of skills in different areas of radiographic interpretation. For example, it may be used to evaluate the effect of varying image contrast on the students' ability to diagnose interproximal caries. Digital imaging may also be used to analyze the effect of varying any one of the image quality parameters — such as image size — in the photographs used in student testing.

4. Intercollegial Collaboration

Digital imaging, as it becomes more commonplace, will facilitate collaboration between universities

on case studies of educational merit. In contrast to the efforts and costs associated with sending film through the mail, digital imaging allows film to be transported immediately (by modem) to any number of geographically diverse destinations. This should benefit dental education through the infusion of new resource material and ideas into Canada's faculties, as well as through the professional development of the teaching faculty.

5. Patient Education

Computers, intraoral cameras, and digital imaging are already being used in dental operatories. With this technology, radiographic and video images can actually be projected onto a screen at the patients' chair side, allowing the

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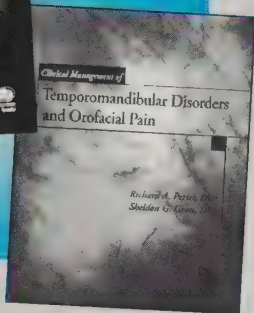
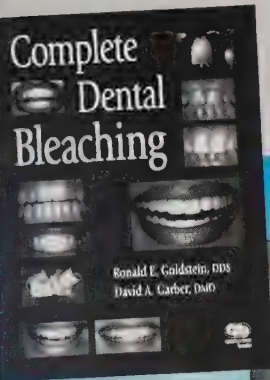
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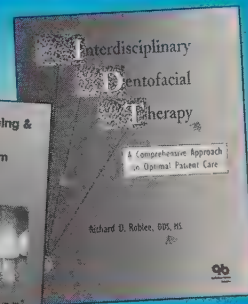
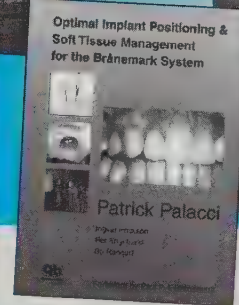
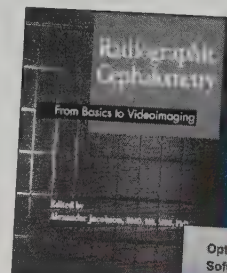
Edited by Alexander Jacobson

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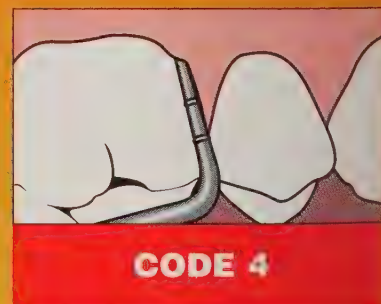
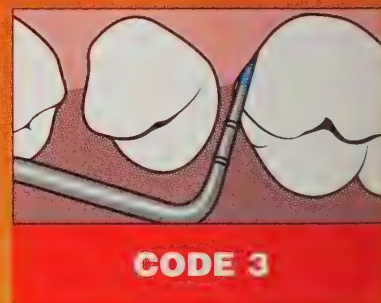
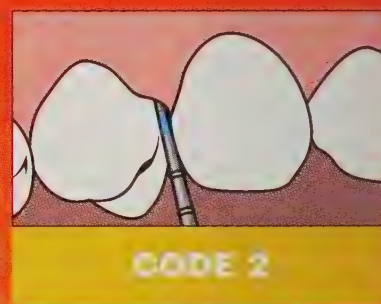
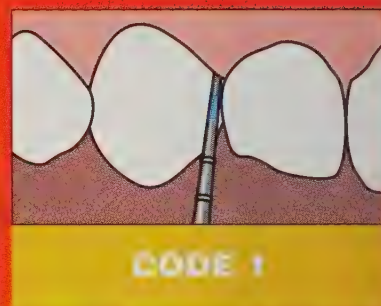
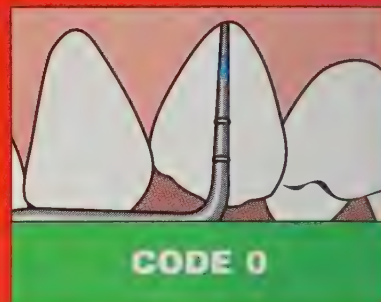
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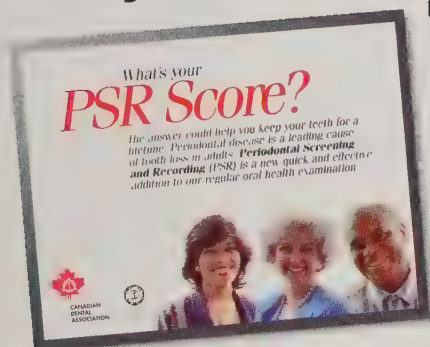
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dentist to optimally display radiographic findings in a way that patients relate to.

Dentists can also manipulate these radiographic images to help illustrate and educate patients about their dental health. As digital imaging systems become more readily available in private dental settings, we can expect to see an increase in patient/dentist-computer interactions related to treatment acceptance and patient education.

Currently, there are some limitations to the use of indirect digital imaging. Image quality, for example, depends on the sophistication (and cost) of the equipment used to digitize radiograph — the scanner, the CPU, monitor and digital film recorder, and the software program. At best, the overall resolution of the digitized image will be equal to or less than that of the original film. Although good overall optical quality may be achieved in a 35 mm slide, using either computerization or photography, the lower cost of generating an image with excellent optical

qualities directly onto paper gives photography an advantage over computerization.

The image resolution achieved using other output mediums, such as CCD, is not as high. Because of this, the use of these mediums as educational tools is impractical. Computer memory is also a factor. The use of digital imaging to record extraoral radiographic films may be limited because of their large size. Memory also limits the use of some output formats, particularly floppy discs, dedicated hard drives, taped back-ups and CD-ROMs.

Digital imaging is therefore not advocated as a replacement for conventional radiography or photography in education. It does, however, have the potential to be a valuable adjunctive resource.

The rapid evolution of computer technology, along with the widespread use of computers within the dental community, are also likely to increase the use of digital imaging in the study of oral radiology. ■

Dr. Bourgeois is in private radiology practice in Toronto, Ont.

Dr. Sikorski is assistant professor and director of oral radiology, faculty of dentistry, University of Toronto. She is also president of the Canadian Academy of Oral and Maxillofacial Radiology, and maintains a private practice in oral radiology in Toronto, Ont.

Dr. Wood is assistant professor at the University of Toronto and is on staff at the Ontario Cancer Institute/Princess Margaret Hospital in Toronto, Ont.

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RADIOLOGY



Radiographic Selection Protocol For New and Recall Patients In U.S. and Canadian Dental Schools

J. Sean Hubar, DMD, MS

Russell J. Cresson, DDS

ABSTRACT

This study indicates that a growing number of dental schools are now using individual selection criteria to determine which radiographs, if any, are required for screening new and recall patients. A majority of Canadian schools are in compliance with CDA's Guidelines For the Control Of Radiation In the Dental Office, which state that the frequency of radiological examination is a matter of clinical judgment, and that it should not be considered as a routine procedure. In general, most schools support the use of individual selection criteria prior to requesting radiographs. The results of this study also indicate that more U.S. dental schools now follow the U.S. Food and Drug Administration's (FDA) recommendations on radiation exposure than at any other time in history. However, both the FDA recommendations and the American Association of Dental Schools' guidelines for prescribing radiographs are only recommendations, which are subject to clinical judgment, and may not be applied universally to all patients.

SOMMAIRE

D'après cette étude, il y a de plus en plus d'écoles de dentisterie qui ont leurs propres critères pour déterminer quand et sur qui prendre des radiographies lors des examens de rappel de l'examen des

nouveaux patients. La majorité des écoles canadiennes obéissent aux directives de l'ADC visant à réduire les radiations au cabinet. Ces directives stipulent que la fréquence des examens radiologiques est une question de jugement clinique et qu'il ne convient pas d'en faire une procédure régulière. En général, la plupart des écoles sont en faveur des critères personnels lorsqu'il s'agit de prendre des radiographies. Par ailleurs, les résultats de cette étude démontrent que, plus que jamais auparavant, plus d'écoles de dentisterie américaines suivent les recommandations de la Food and Drug Administration (FDA) des États-Unis touchant l'exposition aux radiations. Cependant, tant les recommandations de la FDA que les directives de l'Association dentaire américaine à ce sujet sont seulement des recommandations qui sont susceptibles de jugements cliniques et qui ne sont peut-être pas appliquées universellement avec tous les patients.

Introduction

The American Dental Association's (ADA) council on dental materials, instruments and equipment, in conjunction with a panel convened by the Food and Drug Administration (FDA), adopted a set of radiographic selection criteria in 1988.¹⁻³ In Canada, a similar set of radiographic guidelines was approved by the Canadian Dental Association

(CDA) in 1988. The specific goal of the Canadian guidelines was to reduce the amount of radiation that a patient receives.⁴⁻⁶

As recently as 1992, Henry and Kantor, in their surveys on the prescription of dental radiographs (Table I), suggested that dental schools were not meeting the patient care and educational objectives cited in the 1989 position paper released by the American Association of Dental Schools (Radiation use guidelines for dental education facilities).⁷⁻¹¹ Their position, and that of CDA, is that "the need for all radiographs should be determined by using high-yield criteria as the basis for professional judgment."¹⁻⁶ The purpose of this study was to develop a comprehensive questionnaire mirroring the FDA guidelines, and to survey all dental schools in both the U.S. and Canada to evaluate their compliance with these policies.

Methods

In January 1994 a survey questionnaire was sent to 61 accredited dental schools located throughout the United States and Canada. Each school also received directions on how to complete the questionnaire, as well as a self-addressed return envelope. The directions asked a qualified person in the dental radiology department from each school to complete and return the questionnaire. After sev-

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Table 1

Radiographic Examination Of the Dentulous Adult Comprehensive Care Patient In U.S. and Canadian Dental Schools, 1977-92. Number Of Schools (and per cent) Distributed Across Examination Types By Year.

Type of Examination	1977 (66/72)*	1987 (69/69)*	1992 (65/65)*
Full-mouth periapical, bitewing, and panoramic	30 (46% ^{**})	13 (19%)	6 (9%)
Bitewing and panoramic	1 (2%)	0	2 (3%)
Full-mouth periapical and panoramic	1 (2%)	2 (3%)	0
Full-mouth periapical and bitewing	21 (32%)	33 (48%)	37 (57%)
Bitewing and panoramic augmented with selected periapical views	10 (15%)	8 (12%)	3 (5%)
Panoramic only	N/A ^{***}	0	0
Other combinations	2 (3%)	0	0
Selection criteria/patient needs	1 (2%)	13 (19%)	17 (26%)

Radiographic Examination Of the Edentulous Adult Comprehensive Care Patient In U.S. and Canadian Dental Schools, 1987-92. Number Of Schools (and per cent) Distributed Across Examination Types By Year.

Type of Examination	1987 (69/69)*	1992 (65/65)*
Full-mouth periapical, bitewing, and panoramic	0	0
Bitewing and panoramic	0	0
Full-mouth periapical and panoramic	3 (4%)	1 (2%)
Full-mouth periapical and bitewing	0	0
Bitewing and panoramic augmented with selected periapical views	0	0
Panoramic only	54 (78%) [†]	56 (86%) [†]
Other combinations	4 (6%)	1 (2%)
Selection criteria/patient needs	8 (12%)	7 (11%)

Radiographic Examination Of the Child Comprehensive Care Patient In U.S. and Canadian Dental Schools, 1987-92. Number Of Schools (and per cent) Distributed Across Examination Types By Year.

Type of Examination	1987 (67/69)*	1992 (65/65)*
Full-mouth periapical, bitewing, and panoramic	1 (2%)	1 (2%)
Bitewing and panoramic	21 (31%)	18 (28%)
Full-mouth periapical and panoramic	1 (2%)	0
Full-mouth periapical and bitewing	11 (16%)	6 (9%)
Bitewing and panoramic augmented with selected periapical views	14 (21%)	12 (19%)
Panoramic only	0	0
Other combinations	4 (6%)	11 (17%)
Selection criteria/patient needs	15 (22%)	17 (26%)

* Number of responses/number of accredited schools

** Rounded to nearest whole value

*** Not applicable; this category was not specified in the 1977 survey.

† 12 of 54 (1987) 12 of 56 (1992) respondents indicated that selected periapical radiographs were prescribed as necessary based on the results of the panoramic radiographic examinations.

Table II
Radiographs Used At U.S. and Canadian Dental Schools To Screen New Patients (per cent)

Screening New Patients	Panoramic radiograph only	Panoramic radiograph plus bitewings	Full-mouth series plus panoramic radiograph	Full-mouth series only	Selected periapicals only	Bitewing only	Individual selection criteria	Other combinations	Not applicable
A. Patients (as noted below) presenting without evidence of significant clinical caries or periodontal problems									
Child (primary dentition)	**0/0	12.5/28	0/2	0/2	25/6	0/14 [†]	62.5/32	0/6	0/10
Child (transitional dentition)	0/0	37.5/36	0/0	0/6	25/4	0/4	37.5/36 [†]	0/6	0/8
Adolescent	0/0	25/26	0/0	0/26	25/2	0/8	50/26 [†]	0/6	0/6
Adult (partial or complete dentition)	0/0	25/14	0/8	0/42	12.5/0	0/0	62.5/24	0/4	0/8
B. Patients (as noted below) presenting with evidence of moderate to severe clinical caries and/or periodontitis									
Child (primary dentition)	0/0	0/12	12.5/2	0/14	25/10	0/2	62.5/38	0/6	0/16
Child (transitional dentition)	0/0	12.5/14	12.5/4	0/14	12.5/6	0/0	62.5/46	0/4	0/12
Adolescent	0/0	12.5/10	12.5/6	0/36	12.5/4	0/2	62.5/32	0/6	0/4
Adult (partial or completed dentition)	0/0	0/4	12.5/10	25/56	12.5/4	0/2	50/16	0/4	0/4
C. Edentulous adult without evidence of clinical pathology									
	62.5/76 [†]	0/0	0/0	0/0	0/0	0/0	25/16	0/2	12.5/6
D. Edentulous adult with evidence of clinical pathology									
	50/36	0/0	0/0	0/0	0/2	0/0	50/58	0/0	0/4

* n=58 (8 Canada, 50 U.S.)

** Canada/U.S.; percentages of country total

[†] FDA Guidelines

eral weeks, a follow-up questionnaire was mailed to every school that had not responded.

Using the selected patient categories listed in the questionnaire, survey respondents were asked to indicate which response best matched their school's standard radiographic examination protocols (**Table II** and **Table III**). The patient categories listed in the questionnaire were based on the FDA's guidelines for prescribing dental radiographs, which were adopted in 1987.⁷ If none of the combinations of radiographic examinations listed in the

questionnaire were applicable, the respondent had the option of selecting the other combination category, and briefly noting his or her school's preferred radiographic procedure.

Results

Fifty-eight of 61 schools (50 U.S. and eight Canadian faculties) responded to the questionnaire. Responses to the section of the survey questionnaire pertaining to screening patients (i.e. new patients) are given in **Table II**. Similarly, **Table III** provides responses

with respect to the treatment of *recall patients*. A collation of the data has been included in each table. Note that the responses from Canadian and U.S. schools have been separated. The FDA recommendations have been highlighted on each table, wherever appropriate, to facilitate a comparison of current school policies with FDA guidelines. This information was not supplied to schools with the original questionnaire.

In screening children, 32 per cent of U.S. dental schools currently use individual selection cri-

Table III

Radiographs Used At U.S. and Canadian Dental Schools To Screen Recall Patients (per cent)

Recall Patients	Panoramic radiograph only	Panoramic radiograph plus bitewings	Full-mouth series plus panoramic radiograph	Full-mouth series only	Selected periapicals only	Bitewing only	Individual selection criteria	Other combinations	Not applicable
A. Patients (as noted below) presenting without evidence of significant clinical caries or periodontal problems									
Child (primary dentition)	**0/0	0/0	0/0	0/0	25/4	12.5/42 [†]	62.5/42	0/0	0/12
Child (transitional dentition)	0/0	0/2	0/0	0/2	25/4	0/42 [†]	75/44	0/2	0/4
Adolescent	0/0	0/2	0/0	0/2	25/4	12.5/44 [†]	62.5/46	0/0	0/2
Adult (partial or complete dentition)	0/0	0/0	0/0	0/2	25/8	12.5/40 [†]	62.5/48	0/0	0/2
B. Patients (as noted below) presenting with evidence of moderate to severe clinical caries and/or periodontitis									
Child (primary dentition)	0/0	0/8	0/0	0/4	50/8	12.5/24	37.5/48 [†]	0/4	0/4
Child (transitional dentition)	0/0	0/12	0/2	0/6	50/2	12.5/16	37.5/56 [†]	0/2	0/4
Adolescent	0/0	12.5/10	0/2	0/16	37.5/2	12.5/12	37.5/56 [†]	0/0	0/2
Adult (partial or completed dentition)	0/0	0/6	0/4	12.5/30	25/2	12.5/4	50/50	0/2	0/2
C. Edentulous adult without evidence of clinical pathology									
	12.5/20	0/0	0/0	0/0	0/2	0/0	25/30	0/0	62.5/48
D. Edentulous adult with evidence of clinical pathology									
	25/28	0/0	0/0	0/0	0/4	0/0	50/52	0/0	25/16

* n=58 (8 Canada, 50 U.S.)

** Canada/U.S.; percentages of country total

[†] FDA Guidelines

teria for requesting radiographs to assess the primary dentition, compared with 62.5 per cent of Canadian schools. Similarly, 28 per cent of U.S. schools routinely take a panoramic radiograph plus bitewings on each new child, while selected periapicals are the second procedure choice among 25 per cent of Canadian schools.

For new pediatric patients in the transitional (i.e. mixed) dentition stage, with or without evidence of significant caries and/or periodontal problems, approximately 36

per cent of both U.S. and Canadian schools typically use either individual selection criteria or a panoramic radiograph plus bitewings.

Similarly, for an initial examination of adolescent patients presenting without evidence of significant clinical caries or periodontal problems, 26 per cent of U.S. schools use individual selection criteria, a full mouth series only, or a panoramic radiograph plus bitewings. By way of contrast, 50 per cent of

Canadian schools primarily use individual selection criteria for this patient group.

More significantly, perhaps, a majority of U.S. schools (36 per cent) use a full mouth series of radiographs, followed closely by individual selection criteria (32 per cent), for adolescents with significant clinical caries and/or periodontal problems. Once again, Canadian dental schools overwhelmingly use individual selection criteria for this group (62.5 per cent).



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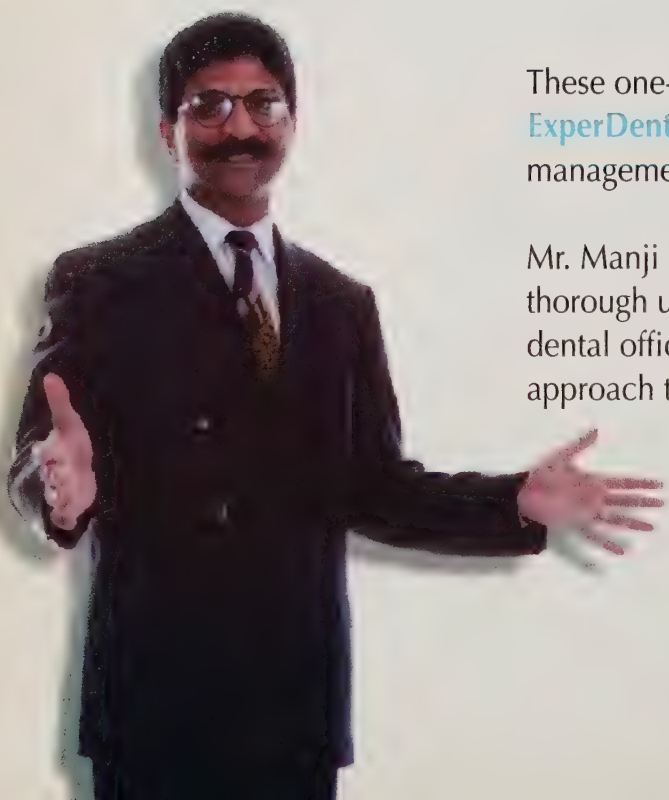
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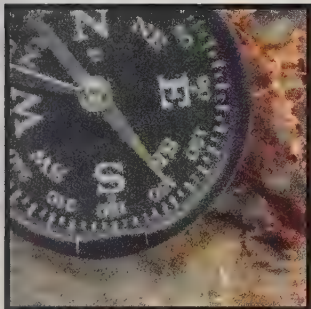
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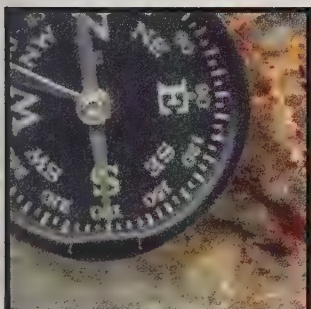


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Adults presenting without evidence of significant clinical caries and/or periodontal problems in the U.S. typically receive a full-mouth series of radiographs (42 per cent of schools). The situation is quite different in Canada, where 62.5 per cent of dental schools use individual selection criteria for this patient group. The results were similar for those adults presenting with significant caries and/or periodontal problems.

At both U.S. and Canadian dental schools (76 per cent U.S. and 62.5 per cent Canadian), the primary choice for a new edentulous patient presenting without evidence of pathology is a panoramic radiograph only. However, if there is clinical evidence of pathology, individual selection criteria is the selection of choice for 58 per cent of U.S. dental schools, while Canadian schools are split down the middle, with 50 per cent using individual selection criteria and 50 per cent a panoramic radiograph only.

Because of the potential variation in the recall time intervals used by each participating school, the questionnaire did not refer to the patient recall times contained in the FDA guidelines. Most U.S. schools use individual selection criteria to determine appropriate radiographic recall intervals for all patient categories (30 to 56 per cent). This also holds true for most Canadian schools, when the patient presents without evidence of significant clinical caries or periodontal problems. The second choice for U.S. schools is to request bitewings on recall (40 to 44 per cent), with the exception of adolescent and adult patients demonstrating moderate to severe caries and/or periodontal problems. In these cases, a full-mouth series is the second most frequent selection (16 to 30 per cent).

In Canadian dental schools, selected periapicals are the primary choice (50 per cent) when a child presents with significant clinical or periodontal problems, followed by individual selection criteria (37.5 per cent). For the adolescent, equal preference is given to individual selection criteria and se-

lected periapicals (37.5 per cent each). However, for the adult with a partial or a complete dentition, the selection is overwhelmingly based on individual selection criteria (50 to 62.5 per cent). This also holds true for the edentulous adult. Individual selection criteria was the primary choice at both U.S. and Canadian dental schools (25 to 50 per cent).

A very small percentage of the schools which responded to the questionnaire (up to 6 per cent) opted for the other combinations category. As described in the methods section, this selection was used when the responding school's radiographic protocol did not match any of the other selections available in the questionnaire.

The not applicable category was used in a low percentage of situations, primarily when the school's radiology department did not examine a particular type of individual, such as a pediatric patient. In these cases, the individual would typically be radiographed in another department within the school.

Discussion

In the United States, the FDA recommends screening children (i.e. primary dentition) with a posterior bitewing examination if the proximal surfaces of the primary teeth cannot be visualized or probed, while an individualized radiographic examination is recommended for the transitional dentition.⁷ For adolescent and adult patients presenting without significant evidence of clinical caries or periodontal problems, an individualized radiographic examination is recommended for screening purposes. However, the FDA does recommend a full-mouth series of radiographs for those individuals with significant caries and/or periodontal problems.

Although Henry⁸ and Kantor¹⁰ did not discriminate between children with primary dentition, children with transitional dentition, and adolescents with permanent dentition, their results indicated a slow upward trend in the number of U.S. schools using selection cri-

teria between 1977 and 1992 (**Table I**). This study corroborates this upward trend, with 42 to 56 per cent of U.S. schools now professing to use individual selection criteria for screening adolescent and child-aged patients. This is not in direct agreement with the FDA, as noted above. However, it may be argued that the use of individual selection criteria actually exceeds the FDA guidelines, as it requires every individual to be assessed independently. If this view is not acceptable, however, then U.S. schools are still clearly deficient in meeting the FDA guidelines adopted in 1988 for screening new patients.

Previous studies did not separate U.S. and Canadian schools. It is therefore impossible to determine a trend for Canadian schools. Nevertheless, the results of this study indicate that Canadian schools primarily use individual selection criteria for all new patients, excluding edentulous adults. With the exception of children presenting with severe caries and/or periodontal problems, the same applies to recall patients. Overall, Canadian schools are in compliance with the CDA guidelines.

For recall patients, FDA recommends bitewing examinations at different time intervals, depending on whether or not there is significant evidence of caries in the child, adolescent and adult patient. However, FDA recommends an individualized radiographic examination only for patients who exhibit periodontal disease or have a history of periodontal treatment, or for children who are being assessed for growth and development. In general, individual selection criteria was the primary choice for most U.S. dental schools when recall patients presented with or without evidence of clinical caries and/or periodontitis (42 to 56 per cent). For those patients without significant evidence of clinical caries, the preferred protocol was bitewings only, followed very closely by individual selection criteria, among 40 to 42 per cent of schools. This being the case, many U.S. dental schools are

now meeting the patient care objectives of the FDA for recall patients.

The selection of other combinations — accompanied by a written explanation — was generally found to be a variation of another selection in combination with occlusal radiographs. For example, one school used a panoramic radiograph, bitewings and mandibular and maxillary occlusal radiographs for children without any significant evidence of clinical caries or periodontal problems. ■

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Dr. Hubar is faculty member in the department of oral diagnosis, medicine and radiology, Louisiana State University School of Dentistry, New Orleans, La., U.S.A.

Dr. Cresson is a general practice resident at the Veteran's Administration Medical Centre in New Orleans, La., U.S.A.

Reprint requests to: Dr. J.S. Hubar, Department of Oral Diagnosis, Medicine and Radiology, LSUSD, Box 140, 1100 Florida Ave., New Orleans, La. 70119, U.S.A.

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The Changing Face Of HIV Infection: Charting the Pattern Of AIDS In Canada and the United States

Joel B. Epstein, DMD, MSD

Sol Silverman Jr., MA, DDS

The human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) epidemic is now in its second decade. Individuals infected with HIV still face a variable but progressive immunosuppression, which eventually progresses to an AIDS-defining disease. Understanding the dynamic nature of HIV's epidemiology and demographics may help to focus the current educational efforts to control HIV transmission — and ultimately AIDS.

As of March 31, 1995, a total of 11,192 cases of AIDS (the terminal phase of HIV infection) had been reported in Canada. Death had occurred in 7,880 of these cases. The distribution between adults and children and males and females is shown in **Table I**.

At the outset of the epidemic, HIV infection primarily involved homosexual and bisexual men. It is now spreading into the heterosexual population. At present, 77 per cent of HIV-infected Canadians are homo/bisexual men. The remaining 23 per cent of HIV cases are attributed to injection drug use (IDU), heterosexual contact, the receipt of infected blood or blood products, no identified risk factor (probably an

unidentified HIV-positive partner), or occupational exposure.

Females now make up 5.9 per cent of reported heterosexual cases. The changes that occurred in major risk categories from 1988 to 1993 are shown in **Table II**. As can be seen, the number of cases of AIDS due to injection drug use has more than doubled in the past five years. Both contaminated needles and unprotected sex/prostitution are critical factors in the transmission of HIV. Blood transfusions play a lesser role, with transmission via this route accounting for less than three per cent of AIDS cases. Children are primarily infected by their HIV-positive mothers in utero, accounting for about one per cent of all cases.

The United States has the largest population of AIDS patients found in any country. In fact, the total number of AIDS cases reported to the Centers for Disease Control and Prevention (CDC) exceeded 480,000 as of August 1995. More than 180,000 of these cases were reported during the past two years, and more than 1,300 new AIDS cases are reported each week in the U.S.

The fastest spread of HIV infection among Americans is now occurring in the heterosexual population, which makes up 48

per cent of the reported cases. Women comprise one-third of this group and 18 per cent of all currently reported cases. Drug abuse is documented in two-thirds of the heterosexuals with AIDS. The occurrence of HIV infection is greatest in socio-economically and educationally deprived groups, which are generally comprised of blacks and Latinos.

As a result of preventative actions taken by the blood bank, transfusions now account for less than one per cent of AIDS cases. Another one per cent of reported cases occur in children younger than 13 years (who are primarily infected before or during birth). It has been suggested that the HIV testing of pregnant women, combined with the subsequent administration of antiretroviral drugs to those infected with the virus, would reduce the risk of transmission.

The current HIV/AIDS profile in the United States is significantly different from what it was during the first decade, when AIDS primarily occurred in homosexual and bisexual men, and was mostly limited to large cities (**Table III**). Race/ethnicity, socio-economic status, drug abuse and gender are now all associated with the spread of HIV in the

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Table I

Cumulative AIDS Cases In Canada, December 31, 1994

Age/Sex Group		Total Cases	Per Cent of Total	Reported Deaths
Adults	Males	10,000	93.5	7,023
	Females	576	5.4	374
	Subtotal	10,576	98.9	7,397
Pediatric	Males	59	0.6	39
	Females	54	0.5	35
	Subtotal	113	1.1	74
Males		10,059	94.1	7,062
Females		630	5.9	409
Total		10,689	100.0	7,471
Per Cent of Total		100	—	69.9

United States. As a result, the U.S. statistics have reflected a first phase of epidemic transmission due to sexual transmission (mainly male to male (MSM)), a second phase of transmission associated with injection drug use, and a third stage, heterosexual transmission.

In Canada, the overwhelming risk factors for HIV transmission are still sexual in nature. The spread of the infection principally remained confined to those men who have sex with men (MSM). Nationally, however, an increase in the number of cases associated with injection drug use has been documented since 1988 (Table II). A comparison of current cases in Canada and the United States by risk factors is shown in Table III.

Over the past 10 years, the epidemiology of HIV/AIDS in Canada has been more comparable to what occurred in San Francisco than with the epidemiology seen in the United States as a whole, where fewer cases of AIDS in people at risk of infection due to IDU have been documented. In San Francisco, the total number of reported AIDS cases was 22,000 as of August 1995. Sixty per cent of these individuals have died. Homosexual or bisexual male transmission occurred in 84.8 per cent of cases, while injection drug users (IDUs) represented 4.4 per cent of the population. Gay or bisexual male transmission predominated in the 1980s. A decrease in this group began in 1990, and by 1994, 76.5 per cent of re-

ported cases represented MSM and bisexual contact. IDU was reported by 19.5 per cent of AIDS sufferers.

The current prevalence of HIV sero-positivity can be used to predict the future numbers of AIDS cases. Recent reports of a growing outbreak of HIV infection among IDUs in British Columbia was reported by Dr. D. Patrick during the Eighth Annual British Columbia HIV/AIDS Conference, held November 6-8, 1994. In B.C., the total number of HIV-positive blood tests has remained constant between 200 and 300 for each three-month period since 1989. There has been an increase in the number of positive tests among IDUs from less than 20 before September 1991 to between 40 and 70 tests more recently. Also, the per cent of positive serologic tests from IDUs has increased from about one per cent in 1987-1988 to more than five per cent. In addition, individuals who have reported homosexual transmission risk, as well as IDUs and prostitutes who inject drugs, also show an increase in positive tests.

Corresponding to this increase in IDU risk, there was a decline in the number of infected individuals reporting homosexual or bisexual behavior. As expected, there was also a corresponding increase in the number of positive tests in those with heterosexual risk of transmission, and a dramatic increase in new positive tests from individuals receiving blood or blood products.

In a study of 575 B.C. patients with IDU as a risk, males represented 75 per cent of cases. The

Table II

Proportion of Delay — Adjusted Adult AIDS Cases In the Major Risk Categories, By Year Of Diagnosis Of AIDS In Canada (per cent)

Year of AIDS Diagnosis	1988	1989	1990	1991	1992	1993
MSM	81.5	78.1	76.7	73.8	73.5	73.5
IDU + MSM/IDU*	4.6	6.0	6.7	7.9	8.8	10.2
Blood and Clotting Factor Recipients	6.0	4.7	3.7	3.3	2.3	2.2

* MSM = men who have sex with men

* IDU = injection drug use

majority of these new positives were between the ages of 20 and 49. In a subset of these 575 patients, 115 had previously received negative HIV test results a mean of 14.8 months prior to the positive testing. This data strongly suggests an increase in HIV infection among injection drugs users in British Columbia. The relevant factors to consider include an increase in injection drug use, migration of HIV-positive drug users to B.C., inadequate programs to prevent drug use, and the only partial success of a needle exchange program.

If these trends continue, British Columbia and other areas of Canada will experience a "second phase" of HIV transmission and AIDS. This will ultimately lead to a marked increase of cases in women and children, and broaden the scope and base of the epidemic.

It is likely that the risk factors associated with the transmission of HIV and AIDS in Canada will continue to evolve. While risk behaviors are changing, it appears that Canada, at present, may more closely follow the pattern observed in San Francisco as opposed to the one seen in the United States in general.

In summary, the experience in Canada is different than that in the United States relative to the epidemiology of the HIV epidemic. However, an increase in HIV seropositivity in Canadian IDUs demonstrates a shift in this country, and the experience in the United States suggests a possible change in near future trends in Canada. In turn, this may help to focus our educational efforts, particularly since control depends upon behavior modification. ■

Dr. Joel Epstein is head of the department dentistry, Vancouver Hospital and Health Sciences Centre; a medical-dental staff member, British Columbia Cancer Agency; and a clinical professor in the faculty of dentistry, University of British Columbia.

Dr. Sol Silverman is professor of oral medicine, school of dentistry, University of California in San Francisco, Calif.

Table III

Current Major Risk Categories for AIDS — 1994 (per cent)

		Canada	United States
Sex	Males	92.3	81.9
	Females	7.6	18.1
HIV Exposure Category	MSM	69.7	43.3
	IDU	10.7	31.8
	Blood / Blood Product Recipients	2.2	1.6
	Heterosexual Contact	12.5	10.3
	Perinatal Transmission	0.7	1.2
	No Risk Reported	4.1	11.9

MSM = men who have sex with men

IDU = injection drug use

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Miri — Enjoy a half day tour in the town of Miri, located along the coast of the South China Sea.

Kota Kinabalu — View a number of modern and impressive architecture as Kota Kinabalu was completely rebuilt after WWII. The State Museum captivates visitors with its exhibits on ethnography, ceramics, natural history, archaeology and limestone caves.

Sandakan — Browse through a bustling fish and vegetable market. Visit a crocodile farm where crocodiles are bred for their skins.

Hong Kong — The exciting city of Hong Kong has wonderful sites to enjoy: Victoria Peak, Deep Water Bay, Ocean Park, Repulse Bay. End your tour with a visit to Aberdeen, a fishing community with many floating restaurants.

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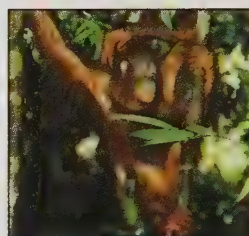
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• **Clearwater Cave** — the largest cave in South East Asia with an underground river flowing through it.

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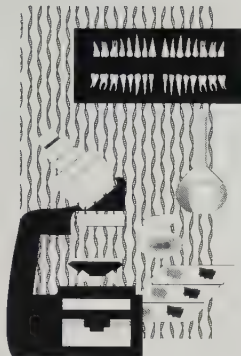
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RESEARCH



Dental Casualties During Canadian UN Operations In Somalia

E.S.C. Swan, CD, B.Sc., DDS, DDPH, MRCD(C)

E. Karpetz, CD, B.Sc., DDS

ABSTRACT

The Canadian Forces Dental Services (CFDS) provides dental support to Canadian Forces (CF) on selected United Nations (UN) duties. This study investigated the nature of dental care sought by and provided to 1,000 Canadian regular force UN peacekeepers by CFDS from January to May 1993, during a 149 day UN mission to Somalia. Care was categorized as either emergency, urgency, or routine. Emergency and urgency care represented 10 per cent and 25 per cent of the 269 patient encounters, respectively. The dental casualty rate (per 1,000 troops per year) was 232.

SOMMAIRE

Le Service dentaire des Forces canadiennes (SDFC) offre des soins dentaires aux Forces canadiennes lors de certaines missions de l'Organisation des nations unies (ONU). Cette étude porte sur la nature des soins dentaires qui ont été offerts par le SDFC et demandée par mille soldats canadiens de l'armée régulière qui ont agi comme peacekeepers de l'ONU de janvier à mai 1993, lors d'une mission de paix qui a duré 149 jours en Somalie. Les soins ont été classifiés en trois catégories : urgents, impérieux et réguliers. Les soins ur-

gents et impérieux ont compté respectivement pour 10 et 25 pour cent de ceux qu'on a donnés en 269 visites. Le nombre des traumatismes dentaires (par mille soldats par année) s'est élevé à 232.

Introduction

The Canadian Forces Dental Services (CFDS) is a support service of the Canadian Forces (CF). Its role is to ensure that members of the CF enjoy a standard of oral health that allows them to perform their military duties effectively, with no need for further treatment other than unforeseen dental care. To achieve this standard of oral health (termed functional fitness), CF personnel undergo annual dental examinations. When it is required, further dental care is provided in garrison.

Prior to their operational deployment, troops are screened and treated for dental conditions that are likely to require emergency care in the next six months. This pre-deployment screening and treatment is aimed at preventing dental emergencies, and is consistent with reports indicating that 70 per cent of dental emergencies are preventable.^{1,2}

During field operations, dental support is required primarily to treat dental casualties resulting from trauma and unforeseen conditions. The most recent informa-

tion on CF dental casualty rates is data collected during field training exercises (Table I). These casualty rates are similar to those experienced by American Forces (Table II).

For a number of reasons, it would be of interest to know the dental casualty rates of Canadian Forces during actual operations. The objectives of this study are: to identify the type (emergency, urgency, routine) of dental visits that occur during a peacekeeping mission; to identify the type of dental procedures provided to the peacekeeping troops; and to identify those dental visits and procedures that are preventable.

Methods

A dental section consisting of a dental officer and a dental assistant provided dental support to Canada's 1,000-member UN peacekeeping mission to Somalia (Operation Deliverance) from January to May 1993. The oral health status of all participating troops was screened prior to deployment and, where necessary, additional dental care was provided to ensure that they were operationally fit.

Following deployment in Somalia, as peacekeepers presented with dental complaints and subsequently received care, the dental officer (E.K.) categorized the care

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provided as either emergency, urgency, or routine (as defined in Table III) and recorded the treatment procedures provided on a standard form — The Return of Dental Treatment (CF 545). If the complaint could have been prevented by secondary preventive measures (i.e. early detection and treatment prior to operational deployment) the letter "P" was recorded along with the category of care.

On return to Canada, data from the standard forms were edited for completeness and logical consistency, and then entered into a personal computer and analyzed using Epi Info Version 5.

Results

Prior to deployment to Somalia, the oral health status of the 1,000 participating troops were screened. It was determined that the troops were either functionally fit or had minimal treatment requirements (less than three hours) to become functionally fit. The troops were then classified as operationally fit for duty or provided the dental care necessary to reach a state of fitness. Following treatment, all troops were considered fit to serve a minimum of six months without the need for other than unforeseen dental care.

During the 149-day operation, there were 269 dental patient visits (Table IV). While 10 per cent were for emergency care, and 25 per cent for urgent care, the majority (65 per cent) of these visits were categorized as routine care.

During the 269 dental patient visits, 985 dental procedures were provided (Table V). For each dental patient visit, the procedure that satisfied the chief complaint was termed the "primary procedure." These primary procedures and their associated category of care are presented in Table VI. Forty-six per cent (12 of 26) of the emergency procedures provided were surgical and involved the extraction of teeth due to either traumatic injury (six), endodontic complication (one), or pericoronitis (five). Seventy-five per cent (51 of 68) of urgency procedures were restorative in nature (i.e. direct restorative materials were in-

Table I

Dental Casualty Rates Experienced by Canadian Forces During Rendez-Vous Exercises 1985 to 1992

Year	Dates	Days	Troops	Dental Casualties	Casualty Rate (per 1,000 per year)
1985	April 15 to June 2 29	74	15,090	373	122
1987	April 6 to June 12	66	10,500	245	129
1989	April 15 to June 12	54	12,880	221	116
1992	March 27 to May 29	64	12,000	321	153

Source: CFDS RV exercise reports

Table II

Dental Casualty Rates Experienced by American Forces, 1966 to 1991

Year	Investigator	Location	Casualty Rate (per 1,000 per year)
1966	Hutchins & Barton ³	Vietnam	66-99
1968	Neel ⁴	Vietnam	142
1969	Ludwick et al ⁵	Vietnam	210
1970	Ludwick et al ⁵	Vietnam	157
1978	Payne & Posey ²	Field exercise	167
1980-81	King et al ⁶	Field exercise	234
1986	Teweles & King ⁷	Sinai peacekeeping	160

Table III

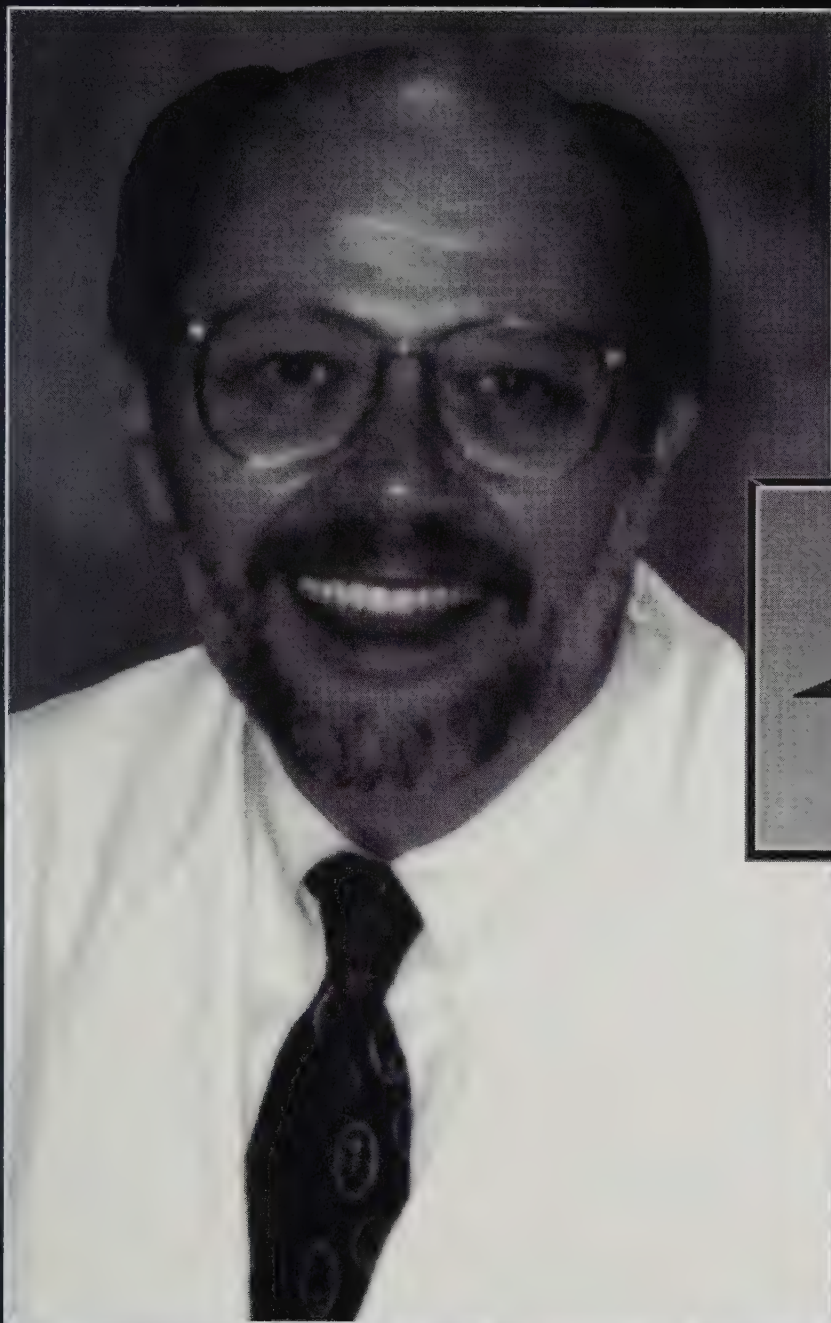
Categories of Care

Code	Category	Description
1	Emergency	Care required immediately to treat acute conditions (pain, infection) and trauma.
2	Urgency	Care required in the next 24 to 48 hours to alleviate discomfort and/or treat a chronic condition.
3	Routine	Care required in the next 12 months to maintain functional fitness in an asymptomatic patient.

involved). Routine dental care was characterized by diagnostic, preventive, and restorative procedures.

The dental officer in Somalia (E.K.) was unable to consistently identify which emergencies and urgencies could have been pre-

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Table IV

Dental Patient Visits by Category of Care

Category	Number	Per cent
Emergency	26	9.7
Urgency	68	25.3
Routine	175	65.0
TOTAL	269	100.0

Table V

All Dental Procedures Provided

Procedure	Number	Per cent
Diagnostic	360	36.6
Preventive	197	20.0
Periodontic	6	0.6
Restorative	276	28.1
Endodontic	24	2.4
Prosthetic	20	2.0
Surgery	19	1.9
Miscellaneous	83	8.4
TOTAL	985	100.0

vented by early detection and treatment prior to deployment. Consequently, this aspect of the investigation was abandoned.

During the 149-day mission, 94 dental casualties (26 emergency and 68 urgency dental pa-

tient visits) were observed. This represents an annual dental casualty rate of 232 per 1,000 troops.

Discussion

An objective of this study was to identify those dental visits and procedures which, in the opinion of

the attending dental officer, could have been prevented by early detection and treatment prior to operational deployment. The difficulty in fulfilling this objective may reflect the unpredictable nature of dental emergencies in general.

The dental casualty rate of 232 per 1,000 troops per year experienced by Canadian troops in Somalia is considerably higher than the normal rates experienced during Canadian field exercises (**Table I**), and is at the upper end of the range of dental casualties experienced by American forces during both operations and training exercises (**Table II**). However, only nine per cent (94 patient visits) of the 1,000 Canadian troops deployed in Somalia required either emergency or urgency care (**Table IV**), in contrast to 15 per cent of British forces in the Gulf War who presented with dental problems.⁸

The surgical extraction of third molars is best performed in a garrison as opposed to a field setting. In Somalia, five per cent of all dental casualties were due to pericoronitis that required surgical extraction of a third molar. This is less than the range of eight to 20 per cent reported in the literature.^{2,5,7-10} However, given that pre-deployment screening and treatment were available, the fact that these teeth required extraction at all is of concern. The absence of explicit clinical guidelines for the manage-

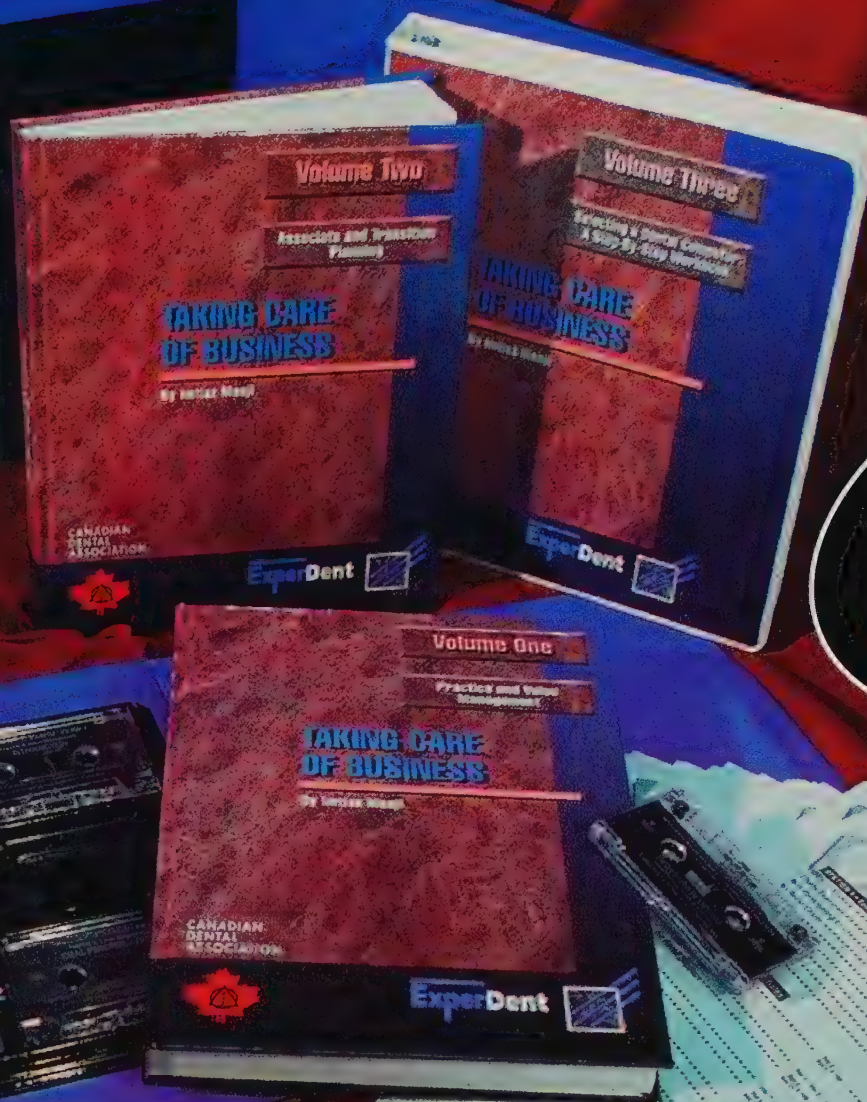
Table VI

Primary Dental Procedures Provided by Category of Care

Procedure	Emergency	Urgency	Routine	Total Number	Per cent
Diagnostic	1	1	22	24	9.3
Preventive	0	0	92	92	34.1
Periodontic	0	0	2	2	0.7
Restorative	4	51	33	88	32.6
Endodontic	1	4	4	9	3.3
Prosthetic	0	8	4	12	4.4
Surgery	12	0	2	14	5.2
Miscellaneous	8	4	16	28	10.2
TOTAL	26	68	175	269	100.0



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ment of third molars may contribute to the uncertainty associated with clinical decision-making in this area, and may result in CF members being sent into operations with oral conditions that put them at risk of becoming a dental casualty.

Emergency rates can be used to measure the outcome of a program designed to provide comprehensive care. The existing reporting mechanism of dental treatment services, both in the field and in garrison, does not capture these data. However, the inclusion of emergency rate data would aid in the evaluation of the CF dental care program.

To reduce dental emergency rates, it is necessary to identify the cause of the emergencies. The current reporting mechanism only captures data on the actual dental procedures performed, and not the diagnoses. In other words, although the number of teeth extracted during a given period can be determined, the reason for their extraction remains buried in clinical records. The development of a form to capture data on the epidemiology of military dental conditions would contribute to the identification of potential dental casualties. ■

Acknowledgments: The authors wish to thank the soldiers of the Canadian Airborne Battle Group who participated in this study; Corporal M. Maggiolo of the Canadian Forces Dental Services for his assistance in collecting field data in Somalia; and Colonel J.E. King of the U.S. Army Dental Corps for his critical appraisal of this article.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Canadian Forces, the Department of National Defence, or the Canadian Government.

Dr. E.S.C. Swan is director of Dental Treatment Services 3, Canadian Forces Dental Services, in Ottawa.

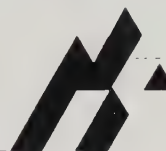
Dr. E. Karpetz is in private practice in Drumheller, Alberta.

Reprint requests to: Dr. E.S.C. Swan, Director of Dental Treatment Services 3, National Defence Headquarters, Ottawa, ON K1A 0K2.

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DENTISTRY CANADA FUND FIRST ANNUAL REPORT

PRESIDENT'S MESSAGE

I am delighted to present the first Annual Report of the Dentistry Canada Fund to our many contributors and supporters. In fact, due to the change of our fiscal year-end, this report covers our work over an eighteen month period — January 1, 1994 to June 30, 1995. It has



Dr. Gordon Thompson

been an extremely busy time for everyone including my fellow Board members, our Fellowship Advisory Committee, and staff as we completed the amalgamation and began our more comprehensive activities in the areas of

research, education, and awareness (the details of which can be found on the next page).

I invite you to carefully examine the contents of this report—especially the Program Highlights page, which gives a great deal of information on how your donations were put to use in the many projects that support our goal of encouraging optimal oral health for all Canadians.

One of our newest fundraising initiatives has been the Dentistry Canada Fund/Aurum Ceramic \$1 Million Challenge Golf Tournaments. It has provided an opportunity for several hundred dental professionals from coast to coast to use their skills in support of the Dentistry Canada Fund. The success of these events is due to a number of companies and in particular Aurum Ceramic and Midland Walwyn Capital Inc.

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Nobilium Canada Inc.
Nova Scotia Dental Hygienists' Association
S. Alberta Forensic Dentistry Society
Société dentaire de la Côte Nord
Space Maintainers Laboratories Canada Ltd.
Swiss NF Metals, Inc.
University of Manitoba Dental Students
The Laurentian/Imperial Company
Wingham and District Dental Society

Associates (\$500 - \$999)

Bolton Dental Manufacturing
Great-West Life Assurance Company
Newcourt Credit Group Inc.

Sustainers ((\$1,000 - \$1,999)

3M Canada Inc.
Air Techniques Incorporated
Alberta Dental Hygienists' Association
Burlington Dental Academy
Canadian Dental Hygienists' Association
Canadian Dental Supply
College of Dental Surgeons of Saskatchewan
Dental Industry Association of Canada
Dépôt Dentaire & Healthco (Canada) Inc.
International College of Dentists
Ivoclar North America, Inc.
Kenora, Rainy-River Dental Society
Kodak Canada Inc.
Manitoba Dental Association

Patrons (\$2,000 - \$3,499)

Aurum Ceramic Dental Laboratories
Canadian Dental Service Plans Inc.
Medi-Dent Service (Div. of Commcorp)
Newfoundland Dental Association
SciCan

Sponsors (\$3,500 - \$4,999)

Midland Walwyn Capital Inc.
Nobelpharma Canada Inc.
Ontario Dental Association

Benefactors (\$5,000 - \$9,999)

Ash Temple Limited
Astra Pharma Inc.
Lakeshore Professional Arts Building Inc.

MAJOR BENEFACTORS (\$10,000 - \$24,999)

Dentsply Canada Limited
Warner-Lambert Canada Inc.
Wrigley Canada Inc.

DISTINGUISHED BENEFACTORS (\$25,000 +)

(CREST) Procter & Gamble Inc.
Canadian Dental Association

PROGRAM HIGHLIGHTS



Dentistry Canada Fund
Fonds dentaire canadien

DCF TEACHING/RESEARCH FELLOWSHIPS

A total of \$46,000 has been awarded to 10 students pursuing postgraduate degrees in dentistry and dental hygiene programs. The two winners of the Henry Thornton Award for a new applicant, sponsored by Dentsply Canada Ltd., were Carl Cramer (1994) and Janice Wilson (1995).

UNDERGRADUATE, UNRESTRICTED & NEEDY STUDENT GRANTS

All 10 Canadian Faculties of Dentistry received grants (up to \$3,500 per faculty) to be used for student awards and fund extraordinary expenses related to program enhancements. The Nicholas Mancini, G.W. Barrett, and Alan Chantler Endowment Funds have provided \$14,000 in financial aid for undergraduate students.

WRIGLEY STUDENT RESEARCH AWARDS PROGRAM

Established in 1991, these annual awards — generously sponsored by Wrigley Canada Inc. — have been made available to Canadian dental students for summer research projects related to current issues in Oral Biology. Over \$20,000 has been awarded in 1994/5.

DENTSPLY STUDENT CLINICIAN PROGRAM

The 24th Annual Student Clinician Program was held in Vancouver in conjunction with FDI in October 1994. Representatives from every Canadian dental faculty partici-

pated in this competition and presentation sponsored by Dentsply Canada Inc.

WARNER-LAMBERT FELLOWSHIPS

Applications from teachers of Canadian Dental Assisting, Dental Hygiene, University, and Community/Special interest projects are adjudicated annually by the DCF Advisory Committee. Over \$15,000 has been awarded in 1994/5 due to the ongoing support of Warner-Lambert Canada Inc.

PROCTER & GAMBLE RESEARCH AWARDS

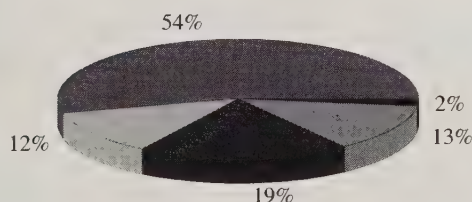
Two \$5,000 awards are being made available for research projects at Canadian Faculties of Dentistry. The Universities of Alberta and Western Ontario were chosen as this years recipients.

SYDNEY WOOD BRADLEY MEMORIAL LIBRARY

Income from the estate of Helen Langstaff and an ever-growing number of donations have provided over \$150,000 for this wonderful resource. The funds are used for operations, and acquisitions of new books, dental publications, and equipment.

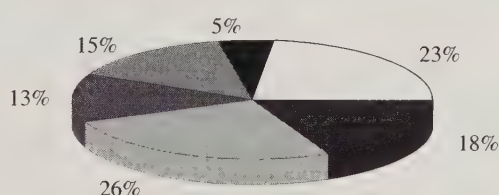
INCOME AND EXPENSES

REVENUES: \$619,015



Investments General Fund Library & Memorial Funds
Education Fund Research Funds

FUNCTIONAL EXPENDITURES: \$604,856



Programs Administration Library
Governance Fundraising Education

A copy of our complete audited statements is available on request.

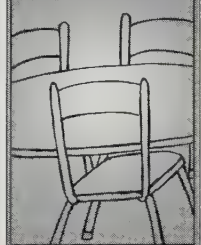
VOLUNTEERS:

Unlike many other association volunteers, Dentistry Canada Fund Board and Committee members receive no per diem or payment of any kind.

JOURNAL

November/
Novembre
1995
Vol. 61
No. 11

MEETINGS & COURSES



INTERNATIONAL



January 19-23, 1996

18th Asian Pacific Dental Congress & 50th Indian Dental Conference in Bombay, India. Contact Dr. Ashok Dhoble, 534 Bombay Mutual Terrace, 2nd Floor, Sandhurst Bridge Opera House, Bombay 400 007 India. Tel.: 91-22-361 0248, or fax: 91-22-367 2627.

February 3-10

36th International Alpine Dental Conference in Courchevel, France. Lecturers: Dr. Lou Rossman, Prof. Ivar Mjör and Fr. Martin Ritzau. Contact the International Dental Foundation, 53 Sloane St., London SW1X 9SW, U.K. Tel.: 00 44 (0) 171 235-0788, or fax: 00 44 (0) 171 235-0767.

March 23-30

37th International Alpine Dental Conference in Courchevel, France. Lecturers: Dr. Oded Bahat and Prof. Birte Melson. Contact the International Dental Foundation, 53 Sloane St., London SW1X 9SW, U.K. Tel.: 00 44 (0) 171 235-0788, or fax: 00 44 (0) 171 235-0767.

May 5-9

5th Congress Of The International Society for Lasers In Dentistry (ISLD) in Jerusalem, Israel. Contact ISLD, P.O. Box 50006, Tel Aviv 61500, Israel. Tel.: 972 3 5140000, or fax: 972 3 5175674 or 972 3 5140077.

June 18-22

The Turkish Dental Association Third International Dental Congress in Ankara, Turkey. Tel.: 0 312 479 79 24, or fax: 0 312 479 79 25.

July 11-13

International Women's Dental Conference in Melbourne, Australia. "Enhancing the balance both personally and professionally." Contact Amanda Lawrence, 3 Railway Walk, Hampton 31188, Australia. Tel.: (03) 9521 6500, or fax: (03) 9521 6501.

CANADA



December 2

Bonded Restorations: How to Make an Informed Choice in Selecting Materials and Techniques. Presenter: Dr. A. John Gwinnett. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

December 2

The Alpha Omega Memorial Lecture: Oral Manifestations Of Infection Disease with Sol Silverman Jr., DDS, MA. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

December 2

Intra-Oral Video Cameras: Dental Image Highway with Dr. Paul M. Eisner. Contact Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

January 12

Pharmacology Review with Dr. D. Haas. Contact Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

January 12-13, 1996

1- Assessment and Management of Medical and Dental Emergencies, 2- Oral Surgery Solutions to Help the Clinician Solve Common Clinical Problems for the Dental Patient. Presenters: Dr. Archie Morrison and Dr. Reginald Goodday. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

February 16-17

Basic Endodontics: Update On Instruments and Techniques. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

February 23

The George Hare Endo Study Club. Dr. Donald E. Arens on "Advanced Endodontic Techniques for Successful Endo Treatment." Contact Dr. Chris Tasios, University of Toronto. Tel.: (416) 751-8400.

February 23-24

Preventive Dentistry Forum — Home Care Products and Office Procedures for the Preventive-Oriented Dental Practice. Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

February 24

Head And Neck Cancer: A Team Approach To Management. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

March 2 — Part I

September 28 — Part II

March 1, 1997 — Part III

Mini-Residency in Periodontics. Presented by the Manitoba Society of Periodontists. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

March 2-4

5th Annual Whistler Resort Dental Seminar. Hosted by the Vancouver Chapter of Alpha Omega Fraternity. Contact Beverly Corber, 6738 Montgomery St., Vancouver, B.C. V6P 4G4. Tel.: (604) 266-2454, or fax: (604) 266-7335.

March 13-16

The 1996 Western Canada Dental Bonspiel in Calgary. Contact Dr. Joey H. Brown, 211-1632 14th Ave. N.W., Calgary, Alta. T2N 1M7. Tel: (403) 289-7370, or fax: (403) 289-6830.

April 18

Emergency Procedures in the Dental Practice — Dr. Earl Young. Contact Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

April 22

The George C. Hare Lecture in Endodontics. Guest speaker: Dr. Gunnar Bergenholtz. Registration limited to 120 persons. Contact Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

April 27

Innovations In Clinical Dentistry: New Directions For the 21st Century — Howard Strassler, DMD. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

May 10-11

Joint meeting of the **Canadian Academy of Periodontology (CAP)** and the **Association of Prosthodontists of Canada (APC)** in Montreal. Contact Dr. Don Kramer (APC), tel.: (416) 597-0839, or Dr. Lorne Wiseman (CAP), tel.: (514) 937-3535.

June 7-9

Canadian Dental Hygienists' Association 7th Annual Professional Conference in Calgary. "Interdependence and Independence: Striking a Balance." Contact Janice Edgar. Tel.: (613) 224-5515, or fax (613) 224-7283.

July 23-26

8th International Congress of the International Association of Oral Pathologists in Toronto. Contact the Congress Office, P.O. Box 1570, 190 Railway St., Kingston, Ont. K7L 5C8.

U.S.A.



December 25 - January 1

Alpha Omega International Dental Fraternity — Annual Convention in Tarpon Springs, Florida. Contact Stephanie Block, 206-1314 Bedford Ave., Baltimore, Md., 21208. Tel.: (410) 602-3300, or 1-800-677-8468.

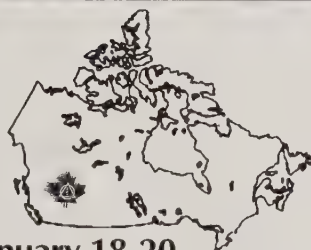
January 25-28, 1996

"Coming of Age," 21st Yankee Dental Congress, in Boston, Massachusetts. Contact Dr. James N. Thiel, Massachusetts Dental Society, 83 Speen St., Natick, Mass. 01760-4144. Tel.: (508) 651-7511.

April 14-16

Minnesota Dental Association's 113th Star of the North Meeting. Contact the Minnesota Dental Association, 2236 Marshall Ave., St. Paul, Minn. 55104. Tel.: (612) 646-7454, or fax: (612) 646-8246.

DENTAL MEETINGS



January 18-20

Annual Meeting of the Manitoba Dental Association in Winnipeg. Contact Mr. Ross McIntyre. Tel.: (204) 453-0055.

March 14-16

British Columbia Dental Meeting in Vancouver. Contact Marilynne Webster. Tel.: (604) 736-3645.

March 29-30

Interim Meeting of the CDA Board of Governors in Ottawa. Contact Suzanne Burton. Tel.: 1-800-267-6354.

May 2-4

Ontario Dental Association Annual Spring Meeting in Toronto. Tel.: (416) 922-3900.

May 9-11

Newfoundland Dental Association Annual Meeting in Cornerbrook. Tel.: (709) 579-2362.

May 23-25

Prince Edward Island Dental Association Annual Meeting in Mill River. Contact Dr. Cheryl Wenn. Tel.: (902) 628-8088.

May 25-29

25^e Congrès annuel de l'Ordre des dentistes du Québec — Les Journées dentaires in Montreal. Contact Nicole Pagé or Ginette Boutin. Tel.: (514) 875-8511, or fax: (514) 875-1561.

May 31-June 1

New Brunswick Dental Society Annual Meeting in St. Andrews. Tel.: (506) 452-8578.

June 6-9

Alberta Dental Association Annual Meeting and Convention in Kananaskis. Tel.: (403) 432-1012.

June 14, 15

Nova Scotia Dental Association Annual Meeting in Baddeck. Contact Mr. Steve Jennex. Tel.: (902) 420-0088.

Notices of meetings and continuing education courses are published without charge for appropriate not-for-profit dental organizations, teaching facilities or recognized study clubs. Information must be received two months prior to expected publication date, and will be published at the discretion of the editor. Send all requests c/o Ms. Rachel Galipeau, *Journal* editorial assistant, Canadian Dental Association, 1815 Alta Vista Dr., Ottawa, Ont. K1G 3Y6.

RADIOLOGIE



Tomodensitométrie et bilan pré-implantaire

Marie Dagenais, DMD, Cert.Rad.Bucc., MRCD(C)

Les implants dentaires représentent désormais une alternative de traitement couramment employée pour restaurer les dents naturelles manquantes. Quel que soit le type d'implant utilisé, l'évaluation radiologique préopératoire requise dans tous les cas d'implantations représente un outil essentiel pour le plan de traitement et le succès à long terme de ces implants. Par le passé, l'évaluation des sites potentiels d'implantations s'est faite surtout à l'aide de clichés radiologiques conventionnels tels que clichés intra-oraux, panoramiques et céphalométriques.¹ Ces radiographies bien qu'utiles, puisqu'elles permettent de localiser la position du canal dentaire et des sinus maxillaires, ne permettent pas d'évaluer l'épaisseur et la morphologie de la crête alvéolaire. Certains patients ont dû attendre jusqu'au moment de leur chirurgie pour apprendre, une fois le lambeau rétracté, que l'épaisseur de l'os n'était pas suffisante pour placer un implant. D'autre part, un cliché panoramique peut présenter jusqu'à 25 p. cent de distorsion, ce qui rend la prise de mesures imprécises.^{2,3} Il a donc fallu se tourner vers des techniques d'imagerie beaucoup plus sophistiquées telles que la

tomographie conventionnelle et la tomodensitométrie pour réussir à évaluer la crête alvéolaire de façon précise en coupes transversales. Cet article se veut un aperçu de l'utilisation de la tomodensitométrie dans le cadre d'un bilan pré-opératoire en implantologie.

La tomodensitométrie, aussi appelé Cat-scan et CT, est une technique d'imagerie découverte en 1972 par Hounsfield,⁴ qui a l'avantage de pouvoir montrer de petites différences de densités entre les tissus mous, d'où son utilisation initiale pour l'étude des lésions du cerveau. Les indications de cette technique d'imagerie se sont rapidement étendues à l'étude de presque toutes les parties du corps. Plus près de nous, la tomodensitométrie sert de façon routinière à l'étude de multiples lésions centrales et périphériques des maxillaires, de certaines conditions des articulations temporo-mandibulaires et anomalies crâniofaciales.⁵⁻²³

Principe de base

L'utilisation de la tomodensitométrie en implantologie a été facilitée par l'accessibilité de plus en plus grande à ce type d'équipement dont les avantages sont reconnus par plusieurs au-

teurs.^{2,3,24-34} La tomodensitométrie permet d'obtenir des images de tranches de tissus d'épaisseur variable dans différents plans. Le scanner consiste en un tube qui émet un faisceau très étroit de rayons-X passant à travers les structures examinées et dirigé vers une série de détecteurs qui mesurent la quantité d'énergie transmise. Le signal mesuré est proportionnel à l'absorption des rayons-X au niveau des tissus traversés par le faisceau. L'image, reconstruite par un ordinateur et présentée sur un écran, est constituée de pixels auxquels est assignée une densité allant du noir au blanc et passant par toutes les teintes de gris. La densité observée à un endroit précis de la coupe correspond à l'atténuation du faisceau à cet endroit précis de la tranche de tissus examinés.

Technique pour bilan pré-opératoire en implantologie

Coupes en incidence axiale

Le maxillaire concerné est examiné dans le plan axial avec des coupes de 1 à 2 mm d'épaisseur, juxtaposées ou se chevauchant. L'incidence des coupes est généralement parallèle à la crête alvéolaire (**Fig. 1**). L'exa-

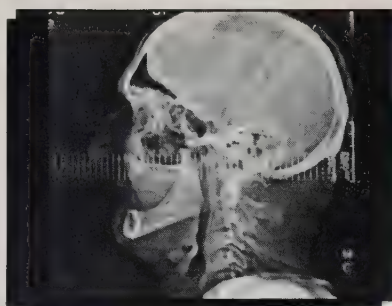


Fig. 1: Cliché pilote (scout view) de profil montrant l'incidence des coupes pour l'examen d'un maxillaire supérieur complètement édenté.



Fig. 2: Position et stabilisation du patient pour un examen en incidence axiale.

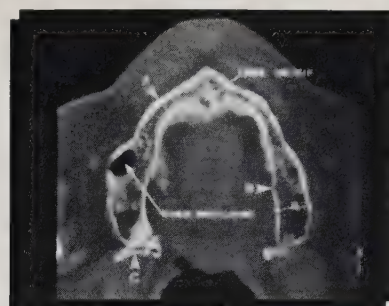


Fig. 3: Coupe axiale au niveau de la crête alvéolaire au maxillaire supérieur montrant l'épaisseur des corticales osseuses vestibulaire (A) et palatine (B), le canal incisif et l'apophyse ptérygoïdienne droite (C).

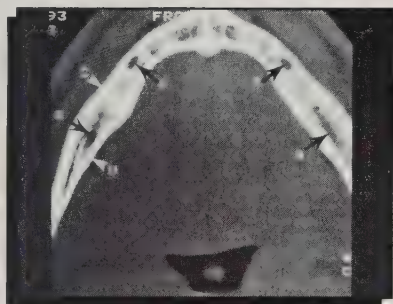


Fig. 4: Coupe axiale au maxillaire inférieur au niveau des trous mentonniers (A) et montrant les canaux des nerfs dentaires inférieurs (B) ainsi que les corticales vestibulaire (C) et linguale (D).

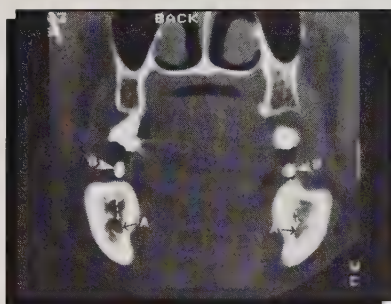


Fig. 5: Coupe en incidence coronale au niveau des régions molaires montrant les crêtes alvéolaires des deux maxillaires et les canaux des nerfs dentaires inférieurs (A). Les chiffres 1 et 2 représentent des mesures de hauteur de la crête prise au niveau de deux marqueurs (B) du dessus de la crête jusqu'au dessus du canal.



Fig. 6: Coupe en incidence coronale au niveau de la région prémolaire dont la qualité diagnostique est sévèrement compromise par les nombreux artefacts causés par les restaurations. À noter la lésion périapicale (A) et l'importante dépression du côté lingual du maxillaire inférieur bilatéralement (B).

men se fait le plus souvent de bas en haut au maxillaire supérieur et de haut en bas au maxillaire inférieur. L'examen du maxillaire supérieur requiert généralement de vingt à trente coupes et celui du maxillaire inférieur de vingt-cinq à trente-cinq coupes. Les coupes axiales sont facilement réalisables puisque le patient est étendu sur le dos (**Fig. 2**). La durée totale de l'examen est d'environ trente minutes. Il est avantageux de présenter les images en grandeur réelle de façon à pouvoir y mesurer directement les sites possibles d'implantations. Les coupes axiales permettent de mesurer l'épaisseur vestibulo-linguale et vestibulo-palatine des crêtes alvéolaires et des corticales vestibulaires, palatines et linguales (**Fig. 3 et 4**). La position de structures anatomiques telles

que le canal incisif, les sinus maxillaires (**Fig. 3**), les trous mentonniers et le canal dentaire (**Fig. 4**) ainsi que le degré de fusion des apophyses ptérygoïdiennes à la tubérosité du maxillaire supérieur y sont clairement visibles (**Fig. 3**). Les coupes axiales permettent aussi une évaluation subjective de la densité de la spongieuse osseuse.

Coupes en incidence coronale

Les images en incidence axiale peuvent servir à évaluer la hauteur d'os disponible en additionnant l'information obtenue au niveau de chaque coupe ce qui est fastidieux et peu pratique. Des coupes perpendiculaires au dessus de la crête alvéolaire, faites en incidence coronale, ont été utilisées et le sont parfois encore dans une tentative d'obtenir des images qui ressembleraient

le plus possible à des coupes transversales (**Fig. 5**). Ces images ne sont pas des coupes transversales puisqu'elles sont à angle droit avec le plan sagittal du patient. Elles ne permettent pas l'examen de la région antérieure des maxillaires et ne reflètent pas la morphologie de la crête de façon précise. Pour cet examen, le patient est étendu sur le ventre, le plan occlusal doit être le plus horizontal possible, ce qui nécessite une hyperextension du cou difficile à obtenir chez la plupart des patients. De plus, en incidence coronale, les restaurations métalliques causent des artefacts pouvant limiter l'interprétation des images (**Fig. 6**). Les coupes coronales directes sont remplacées le plus souvent maintenant par des images de reconstruction.

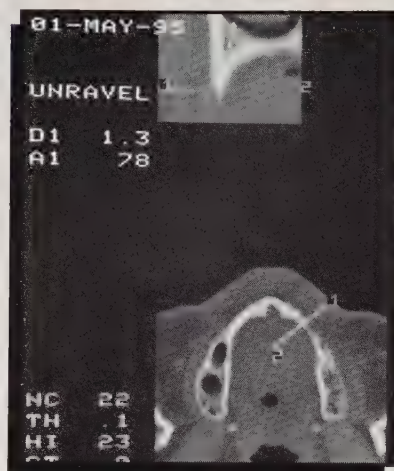


Fig. 7: Reconstruction para-axiale au niveau de la région latérale-canine gauche du maxillaire supérieur à la partie supérieure de la figure. La ligne délimitée par les chiffres 1 et 2 sur l'image axiale indique le niveau de la reconstruction para-axiale. La ligne sous le chiffre 1 sur l'image de reconstruction indique le niveau de l'image axiale située à la partie inférieure de la figure et utilisée comme image de base pour faire les reconstructions.

Images de reconstruction

Après avoir complété l'examen dans le plan axial, de véritables coupes transversales (reconstruction para-axiales) peuvent être obtenues. Il suffit de sélectionner une image axiale à partir de laquelle on demandera à l'ordinateur de produire des images dans d'autres plans. L'ordinateur empile toutes les coupes faites en incidence axiale et produit une nouvelle image dans le plan demandé (**Figs. 7 et 8**). L'image de reconstruction dépend donc de la précision de toutes les coupes axiales. Une reconstruction nette et précise exige que le patient soit complètement immobile pendant toute la durée de l'examen (**Fig. 9**). La tête du patient est maintenue en position à l'aide d'un support avec coussins latéraux et une courroie sous le menton (**Fig. 2**). Les mouvements d'ouverture du maxillaire inférieur peuvent être limités si les dents sont gardées en occlusion durant tout l'examen. Il est préférable de faire l'examen avec des prothèses amovibles en bouche si elles sont en acrylique ou si le métal n'interfère pas

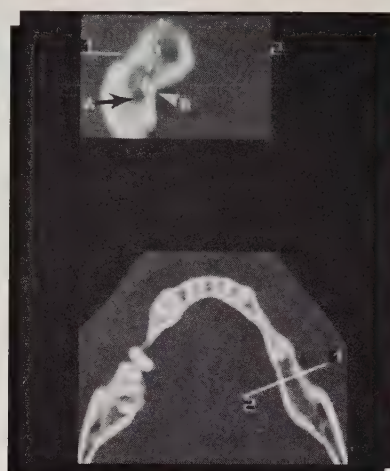


Fig. 8: Reconstruction para-axiale au niveau de la région molaire gauche du maxillaire inférieur à la partie supérieure de la figure. La ligne délimitée par les chiffres 1 et 2 sur l'image axiale indique le niveau de la reconstruction. À noter, le canal dentaire (A) et la dépression pour la glande sous-maxillaire (B).

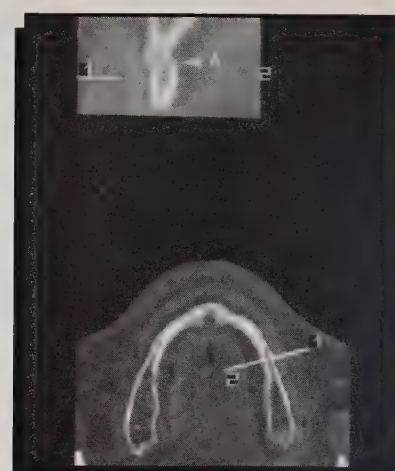


Fig. 9: Image de reconstruction imprécise montrant une marche (A) correspondant au niveau où le patient s'est déplacé pendant l'examen en incidence axiale.

avec les coupes axiales. Les artefacts dus aux mouvements peuvent aussi être minimisés si on prend le temps d'expliquer au patient le but de l'examen et l'importance de rester complètement immobile et si on le familiarise avec le scanner avant l'examen.

L'obtention de reconstructions de façon manuelle prend un temps considérable. C'est la raison pour laquelle des logiciels de reconstruction dentaire ont été développés. Le principe de formation des images en coupes transversales avec logiciel de reconstruction est identique à celui décrit précédemment. Cependant, l'obtention de ces images se fait plus rapidement, le nombre d'images en coupes transversales est supérieur et la présentation des images souvent plus agréable. Une ligne courbe est placée sur le maxillaire examiné. Le programme place ensuite automatiquement de multiples lignes perpendiculaires à la courbe (**Fig. 10**). L'espacement de ces lignes est variable. Ces lignes sont numérotées et corre-

spondent aux images de reconstruction qui seront ensuite produites par l'ordinateur (**Fig. 11**).

Utilisation des reconstructions pour planifier les sites d'implantations

Que les reconstructions soient faites manuellement ou avec un logiciel dentaire, elles contiennent la même information. Elles servent à mesurer la hauteur et la largeur d'os disponible et permettent d'évaluer la morphologie de la région (**Figs. 7 et 8**).

Des diagrammes d'implants de tailles différentes imprimés sur une pellicule transparente peuvent être superposés sur ces images de reconstructions en vue de planifier les sites possibles d'implantations (**Fig. 12**). De nouveaux logiciels interactifs de plus en plus sophistiqués permettent même de simuler la mise en place d'implants (de tailles, diamètres et orientations variables) directement sur ordinateur.³⁵

Dans les cas où des implants doivent être placés à des endroits précis et dans des directions précises, un guide chirur-

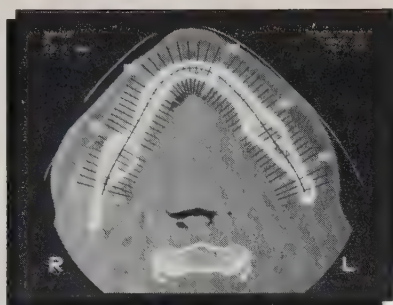


Fig. 10: Une ligne courbe a été placée au centre de la crête sur une coupe axiale au maxillaire inférieur. Cinquante-trois lignes (numérotées de 1 à 53) perpendiculaires à la ligne courbe représentent les reconstruction para-axiales qui seront obtenues.

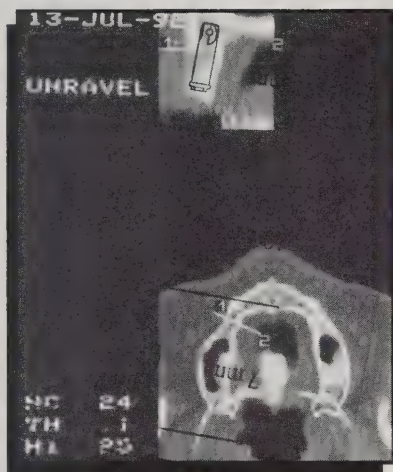


Fig. 12: Reconstruction para-axiale au distal de la canine droite au maxillaire supérieur. Le diagramme d'un implant de 13 mm imprimé sur une pellicule transparente a été superposé sur l'image de reconstruction.

cal contenant des marqueurs peut être porté par le patient durant l'examen. La reconstruction faite au niveau du marqueur indique la hauteur d'os disponible et la morphologie de la crête à cet endroit précis (**Figs. 13 et 5**).

La tomodynamométrie représente un outil important dans l'évaluation des sites possibles d'implantation. Cet article donne un aperçu des possibilités de cette technique d'imagerie. Les progrès au niveau de l'évaluation radiologique permettent d'améliorer le diagnostic, plan de traitement et succès des implantations et contribuent aussi à rendre les attentes des patients plus réalistes. ■

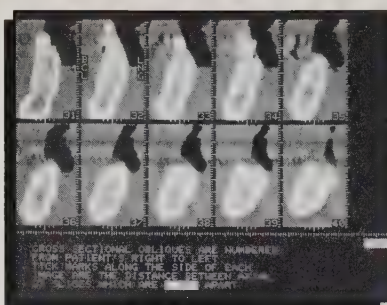


Fig. 11: Reconstructions #31 à 40 des 53 reconstructions de la Fig. 10 représentant la région prémolaire-molaire gauche.

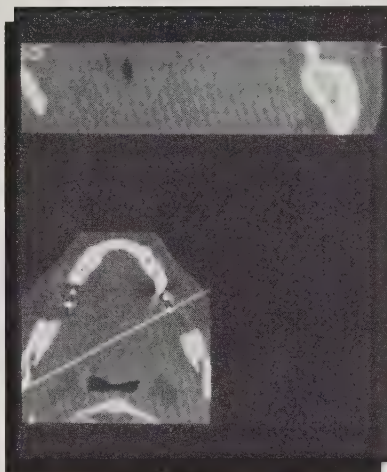


Fig. 13: Image axiale au maxillaire inférieur chez un patient portant un guide chirurgical contenant deux marqueurs au niveau des deux selles libres. La reconstruction para-axiale montre la position linguale du marqueur distal gauche par rapport à la crête alvéolaire.

D^r Marie Dagenais est professeur adjoint à la faculté de médecine dentaire à l'Université McGill.

Demande de tirés à part: D^r M.E. Dagenais, Département de dentisterie, Hôpital Général de Montréal, 1650 ave. Cedar, Montréal, Qué. H3G 1A4.

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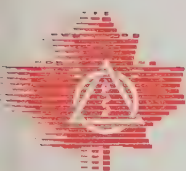


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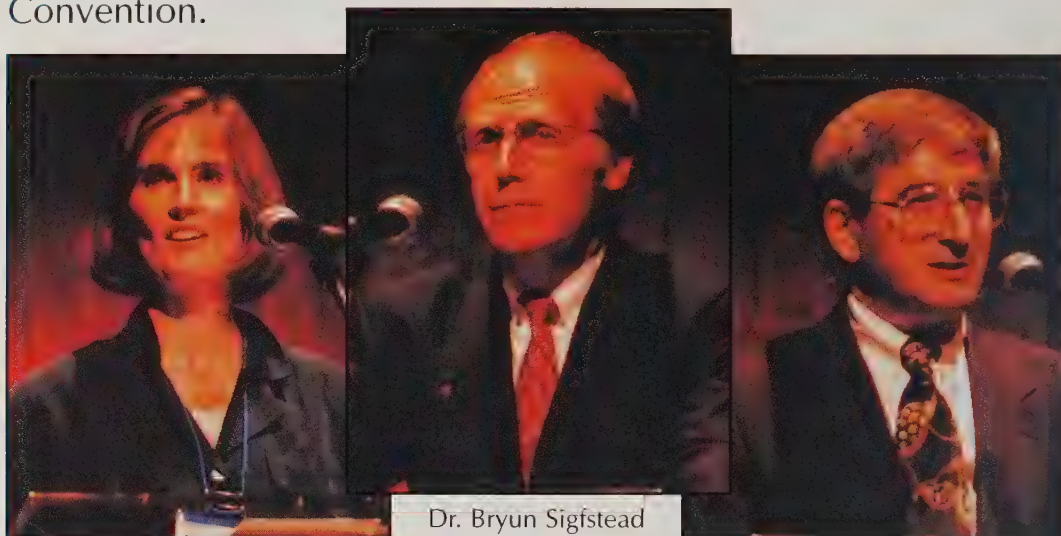
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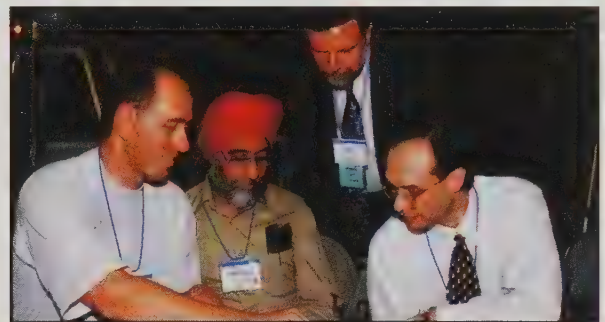
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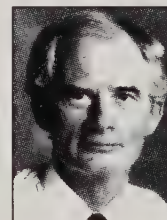
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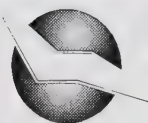
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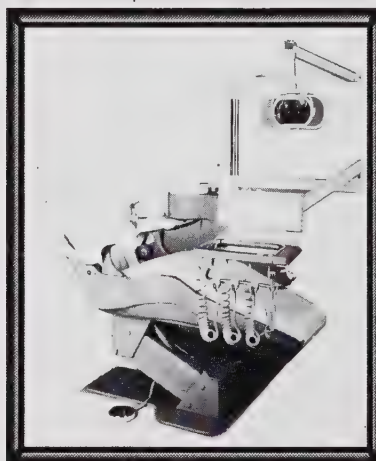
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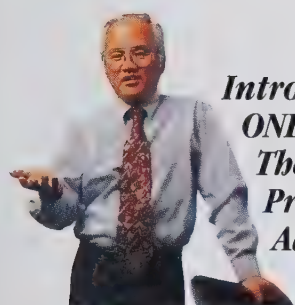
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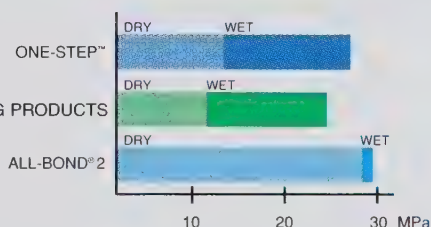
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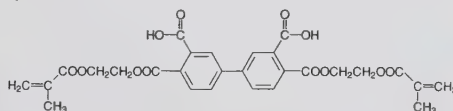
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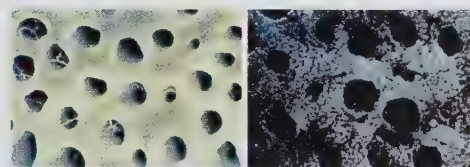


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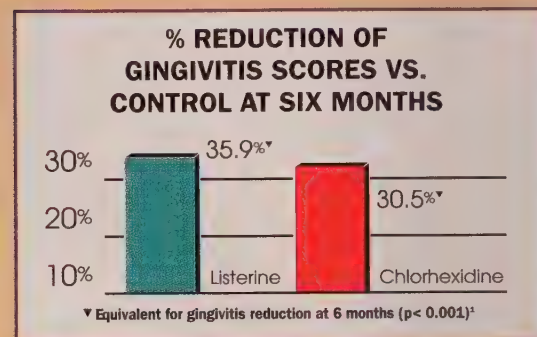
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1. Overholser CD et al. Comparative effects of two chemotherapeutic mouthrinses on the development of supragingival dental plaque and gingivitis. *J Clin Periodontol* 1990;17:575-579

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Vol. 61 No. 12

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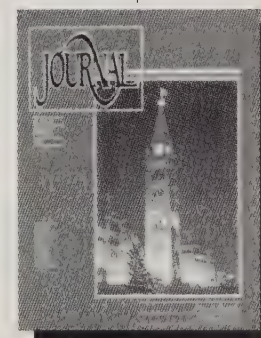
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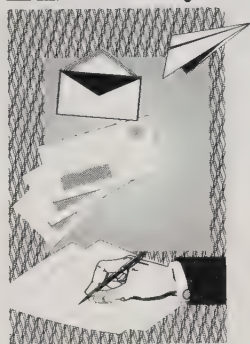
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LETTERS



Diagnostic Tests

I want to congratulate Drs. Matthews, Banting and Bohay of the University of Western Ontario for their excellent article, "The Use Of Diagnostic Tests To Aid Clinical Diagnosis," which appeared in the September 1995 issue of the *Journal* (Matthews, D.C., Banting, D.W. and Bohay, R.N. *J Can Dent Assoc* 61(9):785-791, 1995). Their descriptions about the usual uncertainty of many diagnoses and the need to understand the process of diagnostic testing are clear and well done.

If the evidence-based guidelines they propose in the decision to employ a diagnostic test and determine what qualities that diagnostic test should possess under different considerations of disease severity are followed, more accurate diagnosis and, ultimately, better patient care will result. Their paper is very timely since new diagnostic tests have recently been marketed and diagnostic technology is bound to expand in the future.

I particularly like the authors' **Fig. 1**, and its step-by-step approach from the initial prior probability of a disorder through different pathways, depending on the magnitude of a dentist's diagnostic test and treatment thresholds, to a clinical decision about patient management.

I have already used this paper in a course on clinical epidemiology that I teach to dental specialty and graduate students, as it nicely brings together a number of the technical

points and concepts covered in this course. I have, however, pointed out to the students that the definition and description of a negative likelihood ratio for a 2 X 2 table used by the authors is different from what we (and most texts, I believe) employ, and that a cautionary note about the need for independence of the tests in serial testing is desirable. The students seem to have little trouble recognizing these differences and do, or should, recognize the many virtues of the first part of the paper. I will continue using this paper as required reading in my courses on clinical epidemiology in the future.

Despite the excellence of its first part, the students and I do have some concerns about the paper's second part, the clinical example. This involves a lesion in the mouth of a hypothetical patient for which the pre-test probability of squamous cell carcinoma (SCC) was estimated by the authors at 40 per cent. The decision was then made to use the toluidine blue dye test rather than biopsy this lesion.

Without joining the anti-dye or pro-dye groups described by Matthews et al in the introduction to this paper, the students were concerned about the decision to use the dye test when the pre-test probability (or "best guess," as described earlier by the authors) of SCC was 40 per cent. Although the dye test was positive in the hypothetical scenario, and the biopsy would be done, the 20 dentists in the class all believed that in this case the biopsy should have been the first choice. Most of the students, I believe, felt that the 40 per cent pre-test probability was close enough to the authors' treatment threshold of 48 per cent to warrant biopsy right away.

The students may have had a variety of other reasons for this decision. They had previously been assigned to read a 1994 article in *JAMA* about likelihood ratios in medical diagnosis. This article suggested, because of the uncertainty surrounding pre-test probabilities, that 10 per cent might be added to or subtracted from a pre-test probability to give a range. Others may

have decided to biopsy right away because they already were aware, or may have read in an article by Peters and McGraw in the same issue of the *Journal* (Peters, E. and McGraw, W.T. Detection of Premalignant Oral Lesions: A 10 Year Retrospective Study In Alberta. *J Can Dent Assoc* 61(9):775-778, 1995.), that the transformation rate of oral epithelial dysplasias to carcinomas is consistently 11 to 14 per cent. Still others may have been concerned about the 14 per cent false negative rate reported in one of the three toluidine dye studies cited by Matthews et al. Using this particular study's negative likelihood ratio, we determined that with a pre-test probability of 40 per cent, a negative dye test for this patient would mean a post-test probability of SCC of nine per cent. At least one student thought that a biopsy should be done even with a nine per cent probability. This only serves to emphasize the point that some believe that there is a need to biopsy possibly malignant lesions right away.

I am sure there are many other arguments that the students and I have not recognized that could be made for and against the use of the biopsy first. It would be sad, however, if those favoring strongly one of the two approaches — anti and pro-dyers — ignored the excellent and clear text of the first part of the paper about diagnostic decision making in general in order to focus on the more controversial second part.

Our concerns are not with the diagnostic model proposed by Matthews et al, but with their choice of an example that has previously sparked controversy, and the high pre-test probability of SCC of 40 per cent. Also, the initial treatment in their clinical example is really not a treatment (therapy), but another and arguably more accurate diagnostic test, which suggested to some in the class that another clinical example would have been preferable.

D.W. Lewis, DDS, DDPH, M.Sc.,
FRCD(C)
Faculty of Dentistry
University of Toronto

Toluidine Blue

The September 1995 issue of the *Journal* included a position statement from the Canadian Academy of Oral Pathology (CAOP) regarding the use of toluidine blue as an aid to visual examinations for oral cancer (CAOP Releases Toluidine Blue Statement. [News Update] *J Can Dent Assoc* 61(9):752, 1995).

The CAOP position contained some comments regarding the efficacy and safety of toluidine blue that are not supported by the public literature and that require clarification.

First, I wish to identify myself as an employee of Keller and Heckman, a Washington D.C. law firm that represents Zila, Inc., the manufacturer of OraScan, a one per cent solution of toluidine blue. In my position as staff toxicologist, I have reviewed most of the literature reporting on the safety of toluidine blue and its efficacy for staining squamous cell carcinoma located in various mucosal tissues.

False Positives: The CAOP comment indicated that "the use of this dye by inexperienced persons can result in many false positive results." First, the false positive rate for toluidine blue staining is comparable to or better than other cancer screening tests at the same stage of development.¹ Every new clinical procedure requires experience to achieve optimal results. Second, the public literature suggests that the false positive rate of toluidine blue staining is primarily dependent on, 1) the condition of the oral mucosa;² 2) the types of lesions present;³ and, especially, 3) the staining protocol.^{4,5} False positives are greatly decreased using Mashberg's protocol of repeated staining.⁶

Furthermore, while the public literature on the false positive rate for visual exams is very limited, it is my understanding that many biopsies for oral cancer are negative.^{7,8} It is not unreasonable to believe that the total number of false positives for oral biopsies may be decreased when toluidine blue is used in con-

junction with a careful visual oral examination.⁹

Considering that the five-year survival rate for oral cancer is approximately 50 per cent for all oral and oropharyngeal cancers, and is even lower for some high risk groups (27 per cent for black males), it is highly likely that the false negative rate for visual examination is a dominating factor in the high rate of oral cancer mortality.¹⁰ The low five-year survival rate for oral cancer strongly suggests that clinicians currently do not identify malignant lesions efficiently. Rationalizations may be made for the low discovery rate of early oral cancer, but the fact remains that they are not being discovered early enough. In contrast, the literature clearly indicates that toluidine blue can facilitate the discovery of asymptomatic lesions as well as lesions not readily detected by visual examination.¹¹ Oral cancer has been called the "forgotten disease" and health professionals have been challenged to take a more proactive role in reducing the

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current rates of oral cancer morbidity and mortality.¹²⁻¹⁷

Toluidine Blue Is Mutagenic In Bacteria: Toluidine blue has been shown to cause bacterial mutations and is also clastogenic.^{18,19} A question remains regarding the relevance of such observations. Many dyes and other chemicals are mutagenic or clastogenic because of their molecular shape and charge.²⁰ However, mutagenicity or clastogenicity have not been shown to be generally correlated with any toxic property, including cancer. A series of articles by Ashby and Tennant have established that, in particular, the oncogenic capacity of a chemical cannot be reliably predicted from a positive mutagenicity test.²¹ Of far more relevance to the safety of toluidine blue is the report that it has tested negative for carcinogenicity and promotion in the hamster cheek pouch, a test method more representative of the exposure of oral mucosa to toluidine blue.²²

Oncogenic Activity In Association With Herpes Simplex Virus Infection: The CAOP statement indicated that toluidine blue "may possibly have oncogenic activity when associated with herpes simplex virus infection." This statement is misleading and is not justified by the existing knowledge base on the relation between viruses and human cancer.^{23,24}

The scientific literature forming the basis of the comment originated with studies on the use of photo chemotherapy to treat cancer.²⁵ This literature shows that different types of cancer cells may be killed in the presence of strong visible light and a photo activating dye. Many dyes, including toluidine blue, and other compounds, have been found to be effective mediators in this process. The specific research alluded to in the CAOP comment was initiated by an article that showed that most herpes simplex virus functions, except its transforming ability, are inactivated in the presence of fluorescent light by the dye neutral red.²⁶ This procedure was later shown to be of dubious clinical utility for alleviating herpes simplex infections.²⁷ Subsequent to these studies, three virus strains were shown to retain their oncogenic potential *in vitro*, and the resulting transformed cells

were shown to form tumors when injected into hamsters.²⁸ All of the research on dye-mediated viral inactivation was done in the 1970s, and I have been unable to find any more recent publications to suggest that these findings have any relevance to clinical medicine.

It is extremely misleading to suggest that such experiments suggest a human risk when the data were obtained using viruses not associated with human cancer. It is also unreasonable to conclude that the effect observed in a single experiment with one dye applies to all other dyes. Actually, cancer was not even induced in the test animals. Rather, it was only shown that cells already transformed *in vitro*, when injected into the test animal, grew into a tumor. Thus, an inferred connection between this experiment and human cancer is purely speculative.

The link between human cancer and viruses is tenuous and complex. Several correlations of human cancer and virus occurrence have been found, but a cause and effect relationship has not been established. Finally, the types of viruses used in the experiment were not those closely linked with human cancer.²⁹

New test methods and clinical devices have improved the quality of life of many people who would have died of cancer or suffered disfiguring surgery if their breast cancer, colon cancer, cervical cancer, or prostate cancer was not discovered at an early stage. Screening tests exist for all of these types of cancer. Using such tests, clinicians are able to find cancer in earlier stages than before the tests were available. Toluidine blue staining provides an opportunity to identify a symptomatic oral cancer at a very early stage. This conclusion has been documented as noted above.

Because oral cancer kills thousands of people annually in the United States and Canada, professional organizations such as CAOP and other groups involved with oral health issues must be more proactive in evaluating objectively the means to improve the survival rates of oral cancer patients. Positions taken by such groups should be based on sound science documented in the public literature. The wide use of toluidine blue interna-

tionally as a clinical tool by dentists, oral pathologists, and others is sufficient testimony of the utility of toluidine blue by an informed medical community.

Robert A. Mathews, PhD, DABT

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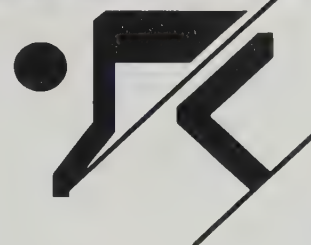
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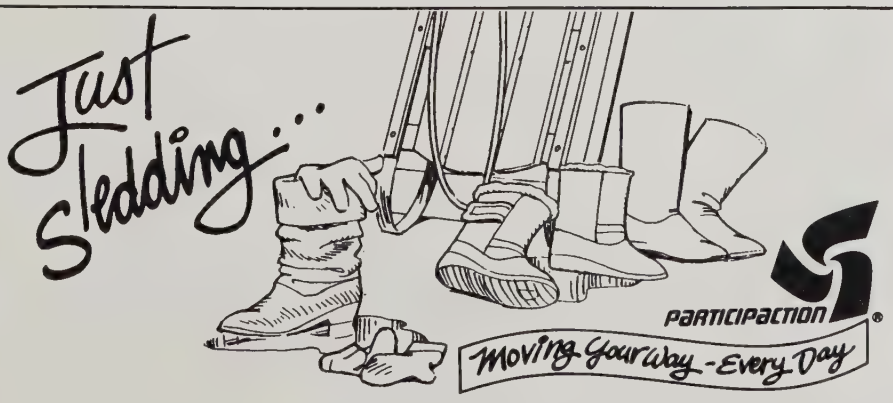
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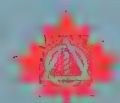
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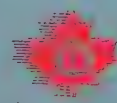
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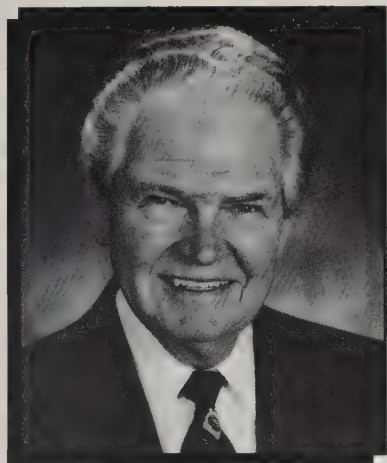
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EDITORIAL

VIOLENCE DEFEATS ITS OWN END



*Dr. P. Ralph Crawford,
Editor.*

For many of us, this has been a fall unlike any other. A season of confusion and division, marred by horror and tragedy.

In October we witnessed the near dissolution of Canada. The country rocked to and fro, pulled by the strings of a referendum campaign that brought forth an outpouring of national pride on the one hand, and a sense of frustration and bitterness on the other. But when all was said and done, nothing changed. The two-century-old problem of defining Quebec's place within Canada is no closer to resolution.

Earlier this fall, our senses were appalled by the unspeakable horrors perpetrated by Paul Bernardo. Meanwhile, south of the border, O.J. Simpson's year-long trial finally came to an end, leading many to question their belief in the ultimate justice of the American legal system.

But the worst horror likely occurred November 4, when a fanatic's bullet took the life of Israeli Prime Minister Yitzhak Rabin.

How, in this particular month, when "peace on earth" and "happy holidays" burst forth from the mouths of joyous millions — do we come to grips with the onslaught of man's inhumanity to man. What can we really say to one another that will make a differ-

ence? Do we dare tell our children about the violence and hatred in our world? What thoughts do we harbor within our own hearts?

There are no simple answers. My own response is to keep telling myself that we can never give up. We cannot abandon our beliefs and values, the intangible concepts that love is better than hatred, forgiveness is better than revenge, and ballots are better than bullets. It doesn't matter what creed or religion we follow. Goodness is always better than evil, and peace infinitely greater than war.

Nor can we abandon this great country of ours. Surely, within Canada's multicultural mosaic, even with all the divisions created by language, culture, and provincial borders, we can achieve greater harmony. Surely, if we make a concerted effort to understand our fellow citizens, we can forge a new consensus of hearts and intellects that cuts across all boundaries.

It is not impossible. If we all made an extra individual effort to assist another less fortunate, support a just cause, or even to understand a different point of view, together we can and will make this country a better place to raise our children and our children's children.

As for the evil that stalks our streets, I feel much consternation and have few answers. I was raised in a place and time when door locks were non-existent, and I find it difficult to understand how anyone can feel gratified or excited by inflicting unspeakable horror and terror on another. I am a pacifist at heart, but I also know that nothing will be gained by purchasing a more powerful gun or carrying a bigger club. Violence begets violence. Education, decency, respect and honor will always work better than force, retribution and punishment.

There is no cause that can atone for senseless violence and assassination. Like you, I do not comprehend how anyone could justify killing Prime Minister Rabin, a man of peace and vision.

But in less than 50 years, seven prominent world leaders have

been murdered by misguided fanatics. Mahatma Gandhi was killed in January 1948. John F. Kennedy was shot to death in 1963, followed by his brother Robert in 1968. Martin Luther King was killed in 1968, Anwar Sadat in 1981, Indira Gandhi in 1984, and Yitzhak Rabin this year.

Each of these leaders was dedicated to building a better world. Three — Anwar Sadat, Martin Luther King and Yitzhak Rabin — had been awarded the Nobel prize for peace.

As individual dentists, many of us feel helpless to solve the world's problems. But there is something that we can do, individually and as members of a profession of the healing arts. We can care. As Sir William Osler, the great Canadian physician-educator, told his students at the turn of the century: "The secret in the care of the patient is caring for the patient."

That truth hasn't changed. Clinical dentists see 10 to 20 patients a day. Within that day, if they care enough to reach out and touch the hearts and minds of these patients, it may just make a difference — in our lives and others.

Prime Minister Rabin's message, delivered during his momentous 1993 meeting with Yasser Arafat on the White House lawn, needs to be repeated again and again: "We say to you today in a loud, clear voice, enough of blood and tears, enough."

Almost two hundred years ago, in times that knew their own horror, William Hazlitt, the English literary critic, wrote: "Violence defeats its own ends. Where you cannot drive surely you can always persuade. A gentle word, a kind look, a good-natured smile can work wonders and accomplish miracles."

Throughout this holiday season and into the New Year, let's remember Hazlitt's wise words. And Mr. Rabin's. Enough of blood and tears. Enough.

*P. Ralph Crawford, BA, DMD
Editor of the Journal
of the Canadian Dental Association*

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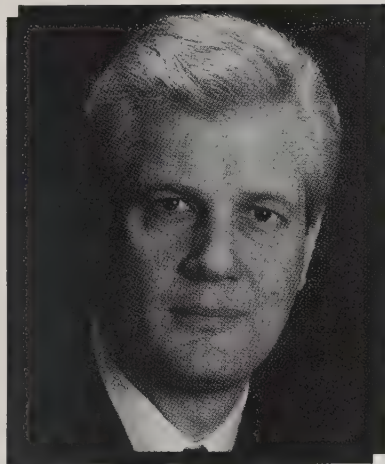
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PRESIDENT'S COLUMN

MANAGING MANAGED CARE



*Dr. Jim Brookfield,
CDA president.*

When dental plans first took root in Canada, they were seen primarily as a neat way to get around the Liberal government's sudden change of heart on wage and price controls. Employees received tax-free benefits in lieu of cash, and employers gained a healthier, more productive workforce.

Dentistry also gained something. Because dental plans allowed employees to pre-pay the costs of treatment, tax free, we gained a huge new pool of patients with the financial means to seek optimal oral health care.

This was also the time when CDA introduced its Dental Awareness Program and the five-point prevention plan. The end result was that prevention — embodied in the concept of the six-month recall — became the watchword of the day.

There is no question that the combination of dental plans and dental health awareness was (and is) highly effective. Over the last 25 years we have witnessed significant gains in the oral health status of Canadians, and Canadian dentistry has earned international recognition.

Unfortunately, dental plans as we know them are in jeopardy. The global marketplace has changed. Employers are no longer looking for innovative ways to compensate their

employees, they're looking for new ways to cut costs and increase competitiveness. And, like it or not, employee benefits don't come cheaply.

The move to cut the costs associated with third-party dental plans actually began several years ago, when employers began restricting the types of treatment covered by the plans. For example, some plans were modified to exclude routine procedures (such as perio scaling) unless they were performed by a specialist. Other plan providers relied on a more frequent and stringent use of the alternate benefits clause (ABC), lower coverage limits, higher co-payments, and the elimination of some types of coverage (TMJ treatment for example) to accomplish the same ends.

None of these tactics were very effective. The costs of providing dental benefits continued to increase despite the cuts. This was the result of a combination of higher administration costs, brought about by the restrictions placed in the plans, and the increased utilization of dental care by Canadians.

At the same time, the combination of tough economic times, an influx of new dentists into the profession during the 1990s, and the success of dentistry's prevention message has led to increased competitiveness in the dental marketplace, along with an influx of advertising, and a renewed emphasis on practice management. In short, dentistry is ripe for change. And it's our task, as a profession, to ensure that this change is in the best interests of our patients and ourselves.

We've seen what could happen if the impending change in Canada's oral health care delivery system spins out of control. It's called managed care, and it currently controls a significant share of the dental benefits market in the United States.

CDA has already taken the first steps toward developing a comprehensive, effective strategy to ensure that the managed care option does not take hold in Canada. Last June, we held a national conference on the future of third-party dental plans. In September, based on the recommendations emanating from the confer-

ence, we announced the formation of a national-provincial steering committee on dental benefits issues. And this November, CDA's executive council approved the committee's strategic action plan. The plan provides the framework for how CDA, with the cooperation of our corporate members, will direct and manage the third-party issue on behalf of dentists and their patients.

In short, the plan calls on organized dentistry to: "Maintain control of dental care in the interests of dentists and patients by developing initiatives to communicate effectively with target publics, and to foster development of funding arrangements supportive of optimal oral health care."

The first step will involve seeking confirmation and acceptance of the plan by the corporate members. Ultimately, our success will depend on us speaking with a unified voice on this issue, and working together to achieve common goals. To this end, we are currently investigating the feasibility of implementing a national direct reimbursement structure, controlled by dentists, to administer dental plans on behalf of Canadian employers and workers.

Managed care is really about managing costs, not care. It's about taking away the patient's right to choose his or her dentist. It's also about putting the risk squarely on the shoulders of participating dentists, forcing them to reduce their fees, and requiring them to provide the least expensive treatment possible, regardless of whether it is in the patient's best interests.

Those of us who lived through the capitation wars of the 1980s know only too well what's at stake. We won that battle, setting the stage for another decade of normal dentist-patient relationships. But managed care is rearing its ugly head once again, and this time the threat is even greater.

All of us must work together to keep it at bay and maintain the integrity of Canada's unique oral health care delivery system.

*James R. Brookfield, DDS
President of the Canadian Dental
Association*

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SELF-LEARNING SELF-ASSESSMENT

The SLSA Program is published as a monthly feature in the *Journal of the Canadian Dental Association* as a resource for dentists wishing to enhance their dental knowledge and expertise. It is intended as a vehicle for self-learning and self-assessment. The program is based on a series of 40 questions, answers, rationales, and references, followed by an annual 15-question quiz. The 1995-96 quiz will appear in the June 1996 issue of the *Journal*. Answers to the quiz will be published in the August 1996 issue. Dentists who complete the quiz may be eligible to receive continuing education points, and their names will be forwarded to their provincial licensing bodies for consideration.

Questions 11 through 15 are a repeat of the questions that appeared in the November issue of the *Journal* accompanied with correct answers, the rationales and specific references. Question 16 through 20 are new questions — watch for their answers and rationales next month. Keep all copies of the *Journal* so you can correctly respond to the June 1996 quiz.

QUESTION 11

Bonded amalgam restorations differ from conventional amalgam restorations in that they

- (1) are more conservative of tooth tissue.
- (2) decrease post-operative sensitivity.
- (3) have increased marginal leakage.
- (4) are less likely to lead to cusp fracture.

- A. (1) (3) (4)
B. (1) (2) (3)
C. (2) (3) (4)
D. (1) (2) (4)

ANSWER: D

RATIONALE:

Since silver amalgam by itself cannot bond to tooth structure, retention within a tooth is dependent on intact tooth tissue with appropriate undercutting of walls. Sound tooth is therefore sacrificed and the remaining tooth tissue, especially cuspal, is undermined and therefore more liable to fracture. Resin adhesive bonding materials for silver amalgam have recently been developed and two such materials are Amalgam Bond and All Bond (Liner F).

Amalgam Bond consists of a dentin conditioner, a wetting agent and a bonding agent.

All Bond Liner F consists of a dentin conditioner, a primer and a bonding agent.

In deep cavities the conditioner, wetting agent and bonding agent are well accepted biologically and there is little need to place a lining even when

close to the pulp prior to the amalgam placement. Marginal leakage is almost totally eliminated. Cusp fracture is less liable to occur compared to conventional preparations since in addition to avoidance of undercutting, there is a strengthening of cusps due to the bonding process.

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QUESTION 12

For local infiltration anesthesia, a dentist may use 2 per cent lidocaine with or without epinephrine. When compared to a solution without epinephrine, 2 per cent lidocaine with 1:100,000 epinephrine will result in

- (1) increased heart rate.
- (2) improved anesthesia.
- (3) increased arterial pressure.
- (4) increased hemostasis.

- A. (1) and (3)
B. (2) and (4)
C. (1) (2) (4)
D. All of the above.

ANSWER: B

RATIONALE:

Although it is claimed that cardiac patients should not be exposed to the risk of 1:100,000 epinephrine in local anaesthetic solutions for dental procedures, a recent study (1990) showed no difference in either heart rate or arterial blood pressure when epinephrine was included or omitted from the solution. Such was the case even when considerable increase in the levels of epinephrine were found in the blood plasma. The study involved patients undergoing periodontal surgery. When epinephrine was omitted from the solution, haemostasis was insufficient and anaesthesia inadequate.

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QUESTION 13

Recession of the gingivae on the labial aspects of mandibular incisors of children

- (1) is found in 25 per cent of children.
- (2) should be corrected as soon as possible by gingival grafts.
- (3) requires correction by lateral flap surgery.
- (4) is self correcting.

- A. (1) and (2)
- B. (2) only
- C. (1) and (4)
- D. (4) only

ANSWER: D

RATIONALE:

The literature reports that approximately 8 percent of children show labial recession on mandibular incisor teeth. It has become common practice to subject these teeth to surgical procedures of either a lateral sliding flap or a free gingival graft. Where orthodontics is contemplated, the surgical repair usually precedes the orthodontic therapy.

A recent study of children aged 6-13 years allowed observation and measurement from the gingival margin of the recessed areas to the cemento enamel junction. Observation over 1, 2 and 3 years

saw a gradual reversal of the recession. No site was worse and the majority improved.

REFERENCES:

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QUESTION 14

A panoramic film of a 20-year old male patient shows unerupted mandibular third molars. When determining whether these teeth will erupt, which of the following are reliable predictors of eruption?

- (1) Sufficient mesiodistal third molar space.
- (2) Impaction in soft tissue only.
- (3) Mesioangularity of the unerupted molar.
- (4) The unerupted molar at the same occlusal level as the second molar.
- (5) Verticality of the unerupted molar.

- A. (1) and (2)
- B. (1) (2) (3)
- C. (1) (2) (4) (5)
- D. All of the above.

ANSWER: C

RATIONALE:

When treatment planning for the removal of unerupted molars, panoramic tomography is superior to periapical radiographs in the coverage given. These teeth are two dimensionally projected on the tomogram.

The study by Venta et al (1991) indicated that the third molars that did erupt after the age of 20 years had specific radiographic features at the initial examination:

- root formation was complete,
- the impacted tooth was in soft tissue,
- the impacted tooth was vertical,
- the tooth was at the same occlusal level as the second molar,
- sufficient space existed between the ramus and the second molar.

If these characteristics are all present, there is good predictability of mandibular third molar eruption.

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QUESTION 15

Composite resin restorations may be used in posterior teeth when

- (1) centric stops on the occlusal surface will be supported on the composite resin.
- (2) esthetics is important.
- (3) the bucco-lingual width of the cavity preparation is less than one-third of the intercuspal width of the tooth.
- (4) butt-end joints between the tooth and the composite resin can be provided.
- (5) the gingival cavosurface margin is subgingival.

- A. (1) (2) (3)
- B. (2) (3) (4)
- C. (2) (3) (5)
- D. (1) (2) (5)

ANSWER: B

RATIONALE:

According to Jordan and Suzuki (1991), composite resin restorations are indicated in the posterior region where

- esthetics is of primary importance
- the bucco-lingual width of the cavity preparation is less than one third of the intercuspal width of the tooth.
- butt-end joints between the tooth and the composite resin can be provided.
- where the gingival cavosurface margin is located in intact enamel.
- where centric stops on the occlusal surface are located on sound enamel.

If the gingival wall is related to the cemento-enamel junction, composite resin alone is contraindicated because of the difficulty of securing a positive seal. In such cases, glass ionomer cement should be bonded to the margin and the remainder of the restoration built up in composite resin. Otherwise amalgam or cast gold restorations should be used.

REFERENCES:

- (1) Jordan, R.E. and Suzuki, M. Posterior composite restorations where and how they work best. *JADA* 122:131, 1991

The SLSA program is a resource and service, directed to the dental profession and the licensing authorities, which is intended to help dentists achieve and maintain the high levels of expertise and competence identified by Canadian dental licensing authorities. All questions and other material are based on current, referenced literature.

Financial support for the program has been provided by A-dec, Colgate, the Fowler-Pearce Partnership (Nesbitt Burns), Nobelpharma, and Sci-Can.

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The views expressed in the questions, answers, and rationales of the SLSA program are not necessarily those of the Canadian Dental Association or its related organizations.

THIS MONTH'S FIVE NEW QUESTIONS

QUESTION 16

Osteoporosis is a condition which

- (1) is found only in post menopausal women.
- (2) is asymptomatic initially.
- (3) predisposes to fracture of skeletal bones.
- (4) causes loss of teeth because of caries.
- (5) accelerates ridge resorption in the edentulous mouth.

- A. (1) (4) (5)
- B. (2) (3) (5)
- C. (1) (2) (3)
- D. All of the above.

CDA encourages Canadian dental licensing authorities to recognize the SLSA Program as an appropriate and acceptable resource for dentists seeking to earn the continuing education credits required for the maintenance of licensure.

Currently, all 10 provincial licensing bodies — British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland — recognize the SLSA program for continuing education credits.

QUESTION 17

Penicillin G, Amoxicillin, Ampicillin and Penicillin V are all penicillin antibiotics. Penicillin V is the drug of choice for empirical treatment of odontogenic infections because it

- (1) is highly active against the major pathogens in odontogenic infections.
- (2) has low cost.
- (3) is stable in an acid environment.
- (4) does not impair oral contraceptive efficacy.
- (5) causes less sensitivity reaction.

- A. (1) and (3)
- B. (1) (2) (3)
- C. (1) (2) (3) (4)
- D. All of the above.

QUESTION 18

When fissure sealants are placed inadvertently over existing caries

- (1) the sealant is quickly lost.
- (2) the microorganisms present proliferate.
- (3) the microorganisms present decrease in number.
- (4) caries progresses to involve the interproximal surfaces.
- (5) caries progression is considerably reduced.

- A. (1) only
- B. (2) and (4)
- C. (3) and (5)
- D. (1) (2) (4)

QUESTION 19

A tooth requires surgical lengthening for a full crown restoration. This may result in

- A. pulpal complications.
- B. margin and contour problems.
- C. root caries.
- D. problems with esthetics.
- E. All of the above.

QUESTION 20

Patients with implants can exhibit peri-implant inflammation which is

- A. the same as periodontitis in the natural dentition.
- B. caused by bio-incompatibility of the implant.
- C. due to the rough porous surface of the metal.
- D. plaque induced.

(Answers to questions 16-20 will appear in next month's *Journal*.)

Funding for the SLSA Program has been provided by:

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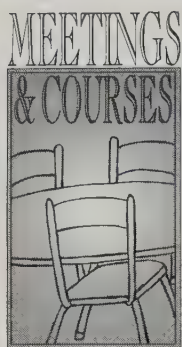
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18th Asian Pacific Dental Congress & 50th Indian Dental Conference in Bombay, India. Dr. Ashok Dhoble, 534 Bombay Mutual Terrace, 2nd Floor, Sandhurst Bridge Opera House, Bombay 400 007 India. Tel.: 91-22-361 0248, or fax: 91-22-367 2627.

February 3-10

36th International Alpine Dental Conference in Courchevel, France. Lecturers: Dr. Lou Rossman, Prof. Ivar Mjör and Fr. Martin Ritzau. Contact the International Dental Foundation, 53 Sloane St., London SW1X 9SW, U.K. Tel.: 00 44 (0) 171 235-0788, or fax: 00 44 (0) 171 235-0767.

March 23-30

37th International Alpine Dental Conference in Courchevel, France. Lecturers: Dr. Oded Bahat and Prof. Birte Melson. Contact the International Dental Foundation, 53 Sloane St., London SW1X 9SW, U.K. Tel.: 00 44 (0) 171 235-0788, or fax: 00 44 (0) 171 235-0767.

May 5-9

5th Congress Of The International Society for Lasers In Dentistry (ISLD) in Jerusalem, Israel. Contact ISLD, P.O. Box 50006, Tel Aviv 61500, Israel. Tel.: 972 3 5140000, or fax: 972 3 5175674 or 972 3 5140077.

May 16-18

1996 British Dental Association Annual Conference in Edinburgh, England. Contact the Conference

Office, British Dental Association, 64 Wimpole St., London W1M 8AL England. Tel.: 0171 935 0875, or fax: 0171 487 5232.

June 18-22

The Turkish Dental Association Third International Dental Congress in Ankara, Turkey. Tel.: 0 312 479 79 24, or fax: 0 312 479 79 25.

CANADA



January 12

Pharmacology Review with Dr. D. Haas. Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

January 12-13

1- Assessment and Management of Medical and Dental Emergencies, 2- Oral Surgery Solutions to Help the Clinician Solve Common Clinical Problems for the Dental Patient. Presenters: Dr. Archie Morrison and Dr. Reginald Goodday. Contact Continuing Dental Education, Faculty of Dentistry, Dalhousie University, Halifax, N.S. B3H 3J5. Tel.: (902) 494-1674, or fax: (902) 494-2527.

February 3

XI PSI PHI Alumni Day in Toronto. Contact Dr. John Wiles, Alumni President, 407-4190 Finch Ave., East, Scarborough, Ont. M1S 4T7. Tel.: (416) 293-3336.

February 16-17

Basic Endodontics: Update On Instruments and Techniques. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

February 23-24

Preventive Dentistry Forum — Home Care Products and Office Procedures for the Preventive-Oriented Dental Practice. Continuing Dental Education, Faculty

of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

February 23

The George Hare Endo Study Club. Dr. Donald E. Arens on "Advanced Endodontic Techniques for Successful Endo Treatment." Contact Dr. Chris Tasios, University of Toronto. Tel.: (416) 751-8400.

February 24

Head And Neck Cancer: A Team Approach To Management. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

March 2 — Part I

September 28 — Part II

March 1, 1997 — Part III

Mini-Residency in Periodontics. Presented by the Manitoba Society of Periodontists. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

March 2-4

5th Annual Whistler Resort Dental Seminar. Hosted by the Vancouver Chapter of Alpha Omega Fraternity. Contact Beverly Corber, 6738 Montgomery St., Vancouver, B.C. V6P 4G4. Tel.: (604) 266-2454, or fax: (604) 266-7335.

March 13-16

The 1996 Western Canada Dental Bonspiel in Calgary. Contact Dr. Joey H. Brown, 211-1632 14th Ave. N.W., Calgary, Alta. T2N 1M7. Tel.: (403) 289-7370, or fax: (403) 289-6830.

April 18

Emergency Procedures in the Dental Practice — Dr. Earl Young. Contact Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

April 22

The George C. Hare Lecture in Endodontics. Guest speaker: Dr. Gunnar Bergenholtz. Registration lim-



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ited to 120 persons. Contact Continuing Dental Education, Faculty of Dentistry, University of Toronto. Tel.: (416) 979-4902, ext. 4503 or 4590, or fax: (416) 979-4941.

April 27

Innovations In Clinical Dentistry: New Directions For the 21st Century — Howard Strassler, DMD. Contact Darcy Duggan, University of Manitoba. Tel.: (204) 789-3331, or fax: (204) 888-4113.

May 10-11

Joint meeting of the **Canadian Academy of Periodontology (CAP)** and the **Association of Prosthodontists of Canada (APC)** in Montreal. Contact Dr. Don Kramer (APC), tel.: (416) 597-0839, or Dr. Lorne Wiseman (CAP), tel.: (514) 937-3535.

June 7-9

Canadian Dental Hygienists' Association 7th Annual Professional Conference in Calgary. "Interdependence and Independence: Striking a Balance." Contact Janice Edgar. Tel.: (613) 224-5515, or fax (613) 224-7283.

U.S.A.



January 25-28

"Coming of Age," 21st Yankee Dental Congress, in Boston, Massachusetts. Contact Dr. James N. Thiel, Massachusetts Dental Society, 83 Speen St., Natick, Mass. 01760-4144. Tel.: (508) 651-7511.

February 29-March 2

Eleventh Annual Meeting of the Academy of Osseointegration in New York, N.Y. Contact Daniel Consiglio, 401 North Michigan Ave., Chicago, Ill. 60611-4267. Tel.: (312) 321-5169, or Internet: daniel_consiglio@osseo.org.

JOURNAL

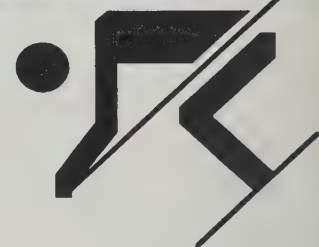
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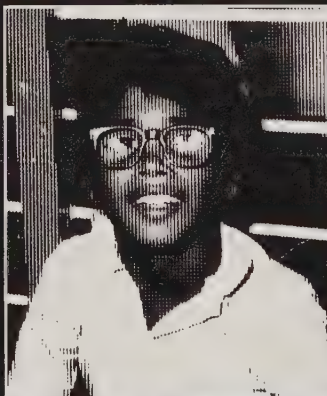
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Operation Eyesight Universal, 759 Warden Ave., Scarborough, Ont., M1L 4B5 (416) 759-8011

March 2-3

The 1996 Moyers Symposium — Creating the Compliant Patient — in Ann Arbor, Michigan. Sponsored by the School of Dentistry and The Center for Human Growth & Development. Contact the Office of Continuing Education, School of Dentistry, University of Michigan, Ann Arbor, Mich. 48109-1078. Tel.: (313) 763-5070, or fax: (313) 936-3065.

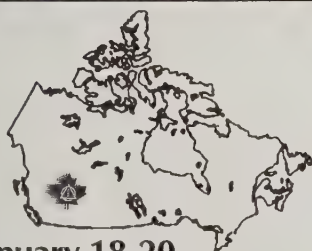
April 14-16

Minnesota Dental Association's 113th Star of the North Meeting. Contact the Minnesota Dental Association, 2236 Marshall Ave., St. Paul, Minn. 55104. Tel.: (612) 646-7454, or fax: (612) 646-8246.

June 13-16

1996 Annual Symposium of the Office Sterelization and Asepsis Procedures (OSAO) Reasearch Foundation in Dallas, Texas. OSAP Central Office, P.O. Box 6297, Annapolis, Md. 21401. Tel.: (410) 798-5665 or 1 (800) 298-6727, or fax: (204) 798-6797.

DENTAL MEETINGS



January 18-20

Annual Meeting of the Manitoba Dental Association in Winnipeg. Contact Mr. Ross McIntyre. Tel.: (204) 453-0055.

March 14-16

British Columbia Dental Meeting in Vancouver. Contact Marilynne Webster. Tel.: (604) 736-3645.

March 29-30

Interim Meeting of the CDA Board of Governors in Ottawa. Contact Suzanne Burton. Tel.: 1-800-267-6354.

May 2-4

Ontario Dental Association Annual Spring Meeting in Toronto. Tel.: (416) 922-3900.

May 9-11

Newfoundland Dental Association Annual Meeting in Cornerbrook. Tel.: (709) 579-2362.

May 23-25

Prince Edward Island Association Annual Meeting in Mill River. Contact Dr. Cheryl Wenn Tel.: (902) 628-8088.

May 25-29

25^e Congrès annuel de l'Ordre des dentistes du Québec — Les Journées dentaires in Montreal. Contact Nicole Pagé or Ginette Boutin. Tel.: (514) 875-8511, or fax: (514) 875-1561.

May 31-June 1

New Brunswick Dental Society Annual Meeting in St. Andrews. Tel.: (506) 452-8578.

June 6-9

Alberta Dental Association Annual Meeting and Convention in Kananaskis. Tel.: (403) 432-1012.

June 14, 15

Nova Scotia Dental Association Annual Meeting in Baddeck. Contact Mr. Steve Jennex. Tel.: (902) 420-0088.

Notices of meetings and continuing education courses are published without charge for appropriate not-for-profit dental organizations, teaching facilities or recognized study clubs. Information must be received two months prior to expected publication date, and will be published at the discretion of the editor. Send all requests c/o Ms. Rachel Galipeau, *Journal* editorial assistant, Canadian Dental Association, 1815 Alta Vista Dr., Ottawa, Ont. K1G 3Y6.

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NEWS UPDATE

CDAnet Reminders

Dentists who send claims electronically via CDAnet must submit them on the same day that the related dental treatment or procedure is provided.

Insurance companies on CDAnet have reported receiving claims as many as 30 days following a procedure, and sometimes receive the same claim twice because of confusion over when (or if) it was sent. The companies have made it clear that they will not adjudicate late claims electronically, and that dentists should not submit the same claim twice, electronically or otherwise.

When a claim is submitted via CDAnet, the dental office receives an Explanation of Benefits if the claim is being processed in real time, or a claims acknowledgement if the claim will be processed in the batch mode. These forms should print out automatically in the dental office. If they don't, dentists are advised to consult their software vendor.

In fact, when a CDAnet claim is processed in real time, the Explana-

tion of Benefits (EOB) should be transmitted electronically shortly after the claim was submitted. A single EOB is printed for an unassigned claim. For an assigned claim, however, the dentist's computer system may actually print two EOBs — one for the dentist and one for the patient — or it may print a single EOB for the patient.

An EOB, claim acknowledgement, or a receipt must be given to each patient before he or she leaves the dental office. Regardless of whether dentists provide an EOB or claims acknowledgement, all patients should receive a receipt, outlining all procedures performed, before they go.

Dentists should also let patients know that any questions they may have regarding their dental benefits should be directed to their insurance company.

In addition, it is important for dentists to inform CDAnet of any change of address or phone number, or if an associate joins or leaves the office. This allows CDAnet and the insurance carriers to maintain accurate records. Failure to inform

CDAnet of relevant changes may result in claims being rejected. ■

Dental Internships in Canada

The CDA committee on student affairs has released a position paper stating its opposition to recent cuts in the funding of dental internship programs.

Written by Dr. Navid Sarooshi, immediate past chairman of the committee, the paper outlines the need for dental internship programs, and explains why the cuts could eliminate this unique educational opportunity for new graduates, and compromise patient care.

"Dental internships provide an invaluable service to many segments of society including the medically compromised, the mentally and physically handicapped, and isolated populations who otherwise would have problems acquiring appropriate care," said Dr. Sarooshi in the paper. "Furthermore, this service is provided at a low cost to all involved parties.

SHOUT CLINIC

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c/o Shout Clinic Dental Committee

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Dentists Give CDA Journal Top Marks

Canadian dentists attending CDA's 1995 Convention in Ottawa ranked the *Journal* as their most-read dental publication by a wide margin.

In a survey of 364 dentists, conducted on the convention floor August 28-29, 96 per cent of respondents reported reading the *Journal of the Canadian Dental Association* regularly, versus 89 per cent for the nearest competitor.

Most dentists, 57 per cent, spend 30 minutes to one hour reading each issue of the *Journal*, while 29 per cent spend one hour or more. Only 27 per cent of dentists spend 30 minutes to an hour reading the *Journal's* closest competitor, with 27 per cent of re-

spondents reported spending one hour or more reading this publication.

Most of the survey respondents practise in Ontario (207). The remainder practice in Québec (54), Nova Scotia (24), Alberta and the Northwest Territories (22), British Columbia and the Yukon (15), Manitoba (14), New Brunswick and P.E.I. (14), and Newfoundland (5). Dentists were asked to identify, from a list of five choices, which professional publications they receive, as well as the number of issues of those publications that they actually read. The five available choices were: the *CDA Journal*, *Oral Health*, *Ontario Dentist*, *JADA*, and other.

Dentists were also asked to indicate the types of articles and features that they would like to see in future issues of the *Journal*. Most (56 per cent) reported that they would like to see more clinical articles. There was also strong support for more case reports, as well as for a New Products column. These results are similar to the results obtained in the 1994 *Journal* readership survey, which polled 1,500 dentists.

CDA plans to increase the original clinical content of the *Journal* beginning in January 1996. We also anticipate introducing a New Products column to the publication early next year. ■

"Currently the internship program is the only program that provides practical training in the management of hospitalized patients and in the treatment of medically-compromised patients. It is also the only source of practical training for dentists to work in institutional settings. With general evidence that the number of aging and medically compromised (e.g. chronic diseases, hepatitis, HIV, etc.) is growing and will continue to grow in the future, internships become a very important, valuable and relevant postgraduate educational opportunity which focuses on precisely these sectors of the population.

"These salaried positions have traditionally been funded in part by government. However, due to recent fiscal restraints, some of this funding has been cut. More specifically in Ontario, the Ministry of Health, in March 1993, announced in a surprise statement that it would stop funding dental internships altogether. This decision was reversed after vigorous protests from the universities, hospitals, organized dentistry, and several other interested groups, and promises were made for renewed funding until June 1994. After June 1994, the hospitals and universities were to find alternative means of funding, which will put the long-term viability of these programs in question.

"Dental internship programs provide new graduates with an excellent and unique educational opportunity and, as such, threats to their future are a major concern to students across the country. We greatly appreciate the efforts made by organized dentistry and the universities so far, and would like to request that the universities and the profession at large continue to put pressure on governments to keep this issue alive. With new advances in medicine, people with complex medical conditions are living longer, and every epidemiological study conducted is predicting a substantial increase in the number of aging and chronically disabled patients.

"In Ontario, the Ministry of Health commissioned an independent report on the status and future of dental internships. One of their key conclusions was that dental internships are an essential part of health care education in Ontario. Despite this conclusion, the funding was eliminated. Government decisions like this one represent short-sighted, ill-informed results of fiscal restraint. The government itself has stated that these programs are cost efficient and provide an essential service.

"In order to prevent the loss of this excellent educational vehicle and avoid a future manpower shortage from occurring, we have to be

more proactive as a profession now and in the future. Actions could include getting the faculties, provincial associations, and interested organizations and patients to communicate with their government officials and to inform them repeatedly of the importance of such care and training. Students and members of the profession should not allow our patients' care to be compromised. We should let the public know that the government will fail to ensure the oral health of an increasingly large segment of the population by abandoning the internship programs, and that, in the long run, everyone stands to lose by such short-sighted decisions." ■

ERRATUM

In the September 1995 issue of the *Journal*, there was an error in an article by Matthews, D.C., Banting, D.W., and Bohay, R.N. (The Use Of Diagnostic Tests To Aid Clinical Diagnosis *J Can Dent Assoc* 61(9):785-791, 1995). On page 788, at the bottom of the page, the sentence that reads, "One advantage of the use of likelihood ratios over sensitivity and specificity is that they are unaffected ..." is incorrect. In fact, this sentence should read: "One advantage of the use of likelihood ratios over predictive values is that they are unaffected ..." ■



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APPOINTMENTS



Mme Diane Lachapelle

Mme Diane Lachapelle has been appointed interim dean of the faculty of dentistry, University of Laval. She succeeds Dr. Rolland Vallée, who passed away earlier this year. Mme Lachapelle joined Laval's faculty of dentistry in 1975 and attained the rank of full professor in 1991. She has served as the vice-dean responsible for first year dental studies since May 1995.

Mme Lachapelle graduated from the dental hygiene program at the University of Montréal in 1974, and earned a masters of science degree in dietetics from the University of Laval in 1980. She is the first non-dentist to be appointed as dean of a Canadian dental faculty, and only the second woman to hold the post.

The University of Laval relies on a unique selection process to choose its dean. Potential candidates are evaluated by a nominating committee, which includes, among other members, the university's rector, four professors from the faculty, a first year and either a second or third year student, and either a graduate of the faculty or an individual not associated with the university. The evaluation is based on the available information, as well as a vote of the entire committee, effectively giving both students and professors a significant say in the selection of the dean.



Dr. Khaled Hashem

Dr. Khaled Hashem of Ottawa, Ontario, has been appointed to the Medical Research Council of Canada (MRC). A 1985 graduate of the University of Toronto's faculty of dentistry, Dr. Hashem also holds a B.Sc. in chemistry from the University of Ottawa, and is a past winner of the National Research Council's Natural Sciences and Engineering Award. MRC's mandate is to promote, assist and undertake

basic, applied and clinical research in health sciences in Canada. It is the major federal agency financing health research and training in Canada, and provides support to as many as 10,000 scientists, technicians and support staff at universities, research institutes and teaching hospitals across Canada in any given year.

Dr. John Kalbfleisch was elected president of the Canadian Association of Orthodontists (CAO) during its 47th annual meeting, held September 15, 1995, in Ottawa. Dr. Kalbfleisch graduated from the



Dr. John Kalbfleisch

University of Western Ontario in 1980 and completed his specialty training in orthodontics at the University of Toronto in 1983. Serving on the CAO executive with Dr. Kalbfleisch for the 1995-1996 term are: Drs. Edwin Yen, Lee Erickson, Ron J. Markey, Arlene Dagys and John Doucet.



Dr. Michael MacEntee

Dr. Michael MacEntee has assumed the presidency of the Royal College of Dentists of Canada (RCDC) for a two-year term (1995-1997). A professor and chairman of the division of prosthodontics in the faculty of dentistry, University of British Columbia, Dr. MacEntee has been an examiner on prosthodontics for the RCDC since 1986 and served on the council since 1988.



Dr. Donald Yu

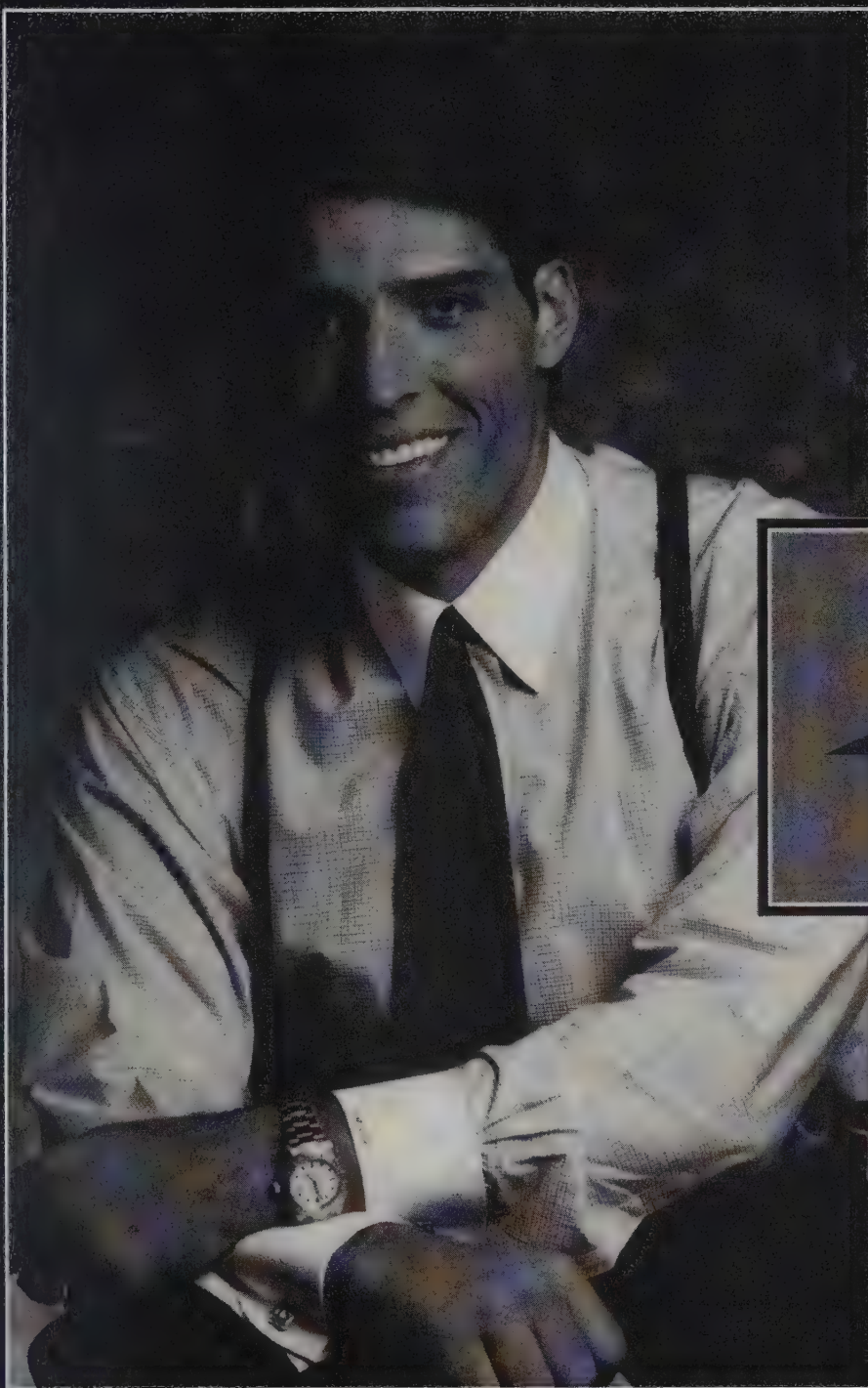
Dr. Donald Yu has been appointed head of the endodontic program in the faculty of dentistry, University of Alberta. (The dental faculty will become the department of oral health sciences in a restructured faculty of medicine on April 1, 1996). Dr. Yu received his DMD degree from the University of Pennsylvania and his graduate degree in endodontics at Boston University.



Dr. Rénaud Morency

Dr. Rénaud Morency has been appointed director of the oral and maxillofacial surgery program in the faculty of dental medicine, University of Laval for a three-year term. He succeeds Dr. André Charest, who founded the program and had been its director since 1970. Dr. Morency has served as a pathologist at the l'Enfant-Jésus hospital since 1973, and is the president of the Association of Pathologists of Québec.

The Decision Is Yours.



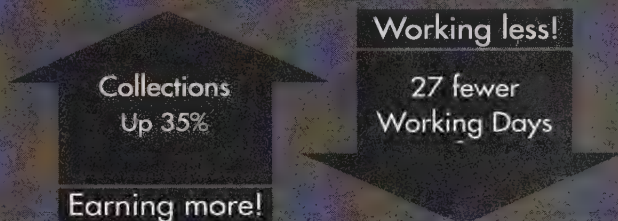
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Contact: Mr. Antoine Altès

- dental and dental laboratory cabinetry

ATP Industries Inc.

(subsidiary of Ash Temple)

462 Wright
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Tel: (514) 856-0018
Fax: (514) 856-1100

Contact: Philippe Aliabadi

- automated injection-moulding system and monomer-free materials for dental prostheses

Beavers Dental

P.O. Box 900
Morrisburg, Ont. K0C 1X0

Tel: (613) 543-3791
Fax: (613) 543-2525

Contact: Mr. R.L. Leroux,
General Manager

- dental burs, drills

Budva Corporation

P. O. Box 850
King City, Ont. L0G 1K0

Tel: (905) 246-1570
Fax: (905) 246-1725

Contact: Mr. Paul Perovich, President

- denture cups

Canadent Manufacturing Ltd.

P. O. Box 72053
Vancouver, B.C. V6R 4P2

Tel: (604) 224-1022
Fax: (604) 224-1022

Contact: Mr. R.M. Sharp, President

- dental chairs, operative chairs

Dentech Products Ltd.

2120 Paramount Cres.
Clearbrook, B.C. V2S 5N5

Tel: (604) 852-6911
Fax: (604) 852-4823

Contact: Mr. John Lytle, Sales Manager

- dental chairs and stools, dental delivery systems

EFOS Inc.

2260 Argenta Rd.
Mississauga, Ont. L5N 6H7

Tel: (905) 821-2600
Fax: (905) 821-2055

Contact: Mr. John Kennedy

- dental lighting equipment, fibre-optic dental light, ultraviolet activator for polymerization, acrylic curing unit, ultraviolet illuminator, AC-powered dental amalgamator, battery-powered fibreoptic dental light

Germiphene Corporation

1379 Colborne St. East
P.O. Box 1748
Brantford, Ont. N3T 5V7

Tel: (519) 759-7100
Fax: (519) 759-1625

Contact: Ms. Leslie Drake

- oral cancer diagnostic kit, surface/instrument disinfectants and sterilants, antimicrobial oral rinses, remineralizing solution and gel, fluorides for office use, home fluorides, disposable fluoride trays, dental prophylaxis, topical anesthetics, general dental pharmaceuticals, plaque disclosing solution

Hygienic Corporation of Canada

14 Northrup Cres., Units 3 & 4
Port Weller Industrial Park
St. Catharines, Ont. L2M 7N7

Tel: (905) 937-5957
Fax: (905) 937-7479

Contact: Mr. Bob Skura, Sales Manager

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Fax: (519) 948-2512

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Suite 830
Toronto, Ont. M5G 1X3

Tel: (416) 340-8818
Fax: (416) 340-0415

Contact: Mike Kehoe, President

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Knowell Therapeutic Technologies

221 Dufferin St., Suite 104A
Toronto, Ont. M6K 1Y9

Tel: (416) 530-4000
Fax: (416) 530-4143

Contact: Mr. Ross Perry, President

- antimicrobial coating for reducing caries risk from Strep. mutans (Chlorzoin)
- diagnostic test for Strep. mutans for use in screening for use of Chlorzoin
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Le-Han Canada Inc.

123 Edward St., Suite 815
Toronto, Ont. M5G 1E2

Tel: (416) 979-3501
Fax: (416) 979-8755

Contact: Mr. Leo Weil

- mouth props, dental retentive pins, crown/inlay removers, glass bead sterilizer

Maxill Inc.

33 Laing Blvd.
St. Thomas, Ont. N5P 3Z4

Tel: (519) 631-7370
Fax: (519) 631-3388

Contact: Mr. John Shaw,
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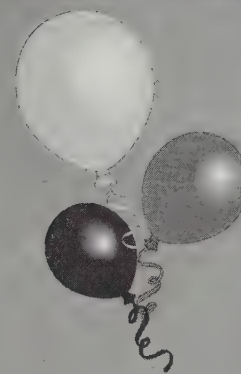
These packages have been compiled over the past year and are available to members for the FABULOUS price of two for \$5. The packages are available to non-members for \$10 each. To place your order, simply call the CDA Library at 1 (800) 267-6354 extension 223. Or, fax us at (613) 523-6574, or through the Internet at cdalib@magi.com.



The following are available at our special price until January 31, 1996:

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ejector mouthpiece, abrasive polishing agent

Medicor Inc.

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Ortho-care Products Inc.

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Fax: (403) 225-0797

Contact: Mr. Robert Westerbeek, Operating Officer

- denture cleaner

Sci-Can Division of Lux & Zwingenberger Ltd.

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North York, Ont. M3B 3P9
Tel: (416) 445-1600
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- high-speed table-top steam sterilizer for dental and other instruments

Strite Industries Limited

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- orthodontic brackets and clamps, tubes

Sulcabras Incorporated

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Further information on the above list and the role of Industry Canada may be obtained by calling Ms. Linda Leinan, industry development officer, (613) 954-3068, or fax (613) 952-4209. ■



RRSP Fees: Are They Eating Away At Your Retirement Nest Egg?

Front-end loads. Deferred declining redemption fees. Trailer fees. The once straightforward world of registered retirement savings plans (RRSPs) is becoming more and more muddled with different types of fees and different combinations of fees.

Clearly, these fees can't be ignored. All of them directly affect the rate of return earned on your RRSP and the amount of money you'll receive on retirement. In fact, a difference of just one per cent in RRSP fees can amount to a difference of about a quarter of a million dollars in your retirement nest egg.

RRSP fees fall into three broad categories: management fees, sales fees, and service fees. All RRSP investment funds have management fees, but not all have sales fees or service fees.

Management fees are usually listed as a "management expense ratio." This fee, which is calculated as a percentage of the fund's assets, is charged to cover the cost of buying and selling securities. Investors don't usually see a billing — the fee is automatically deducted from the fund periodically. Management fees for the CDA RSP are one per cent or less for all funds except the international funds, which have fees of 1.45 per cent. The management fees of most RRSPs range from about two per cent all the way up to four per cent.

There are two kinds of sales fees. Front-end loads are fees that are deducted from the amount you invest — commonly one per cent to seven per cent. Back-end loads, introduced when investors began complaining about front-end load charges, are fees that you pay when you sell. Many back-end

loads start at around five per cent or more for the first year, then decline each year until there is no fee, which can take up to nine years. The term "no-load funds" indicates that there is no sales fee at all. But there is no such thing as a free lunch, so you have to take a careful look at the management and service fees on no-load funds. The same warning applies to back-end loads. You may think you're avoiding fees altogether if you invest in back-end load funds and then keep your money put, but the manager has to get fees somehow, and it's quite often from service fees and a higher management fee.

Service fees are all those other fees. Sometimes you're charged a fee when you open an RRSP. Other times you're charged an annual administration fee. You may also be charged trustee fees and termination fees. Also, you have to count transaction charges, such as the charge for transferring from one fund to another. Over time, these charges can also take a significant bite out of your nest egg.

The CDA RSP has management fees only — there are no sales fees or service fees. But how do you find out about the fees for other plans and funds?

For management fees, it's easy. Just look at the Report on Mutual Funds, which is published on the third Thursday of every month in the *Globe and Mail's* Report on Business. You'll see the current management expense ratios listed in the performance tables.

With investment funds, the rates of return listed in the newspaper tables already have the management fees factored in. But sales fees and service fees are not reflected in these printed rates, so you must still consider the effect

that these fees have on your contribution.

Finding out about sales fees and service fees is not that easy, however. To obtain these figures you have to consult with a financial adviser or speak with individual fund managers.

Some investors may believe that it doesn't matter if a fund's management fee is above average, as long as the rate of return for the year is also above average. But you have to look at the fund's long-term performance. Quite often, the performance of many funds in the same category tends to balance out over time, with similar rates of return. When that's the case, the variance in fees can end up being the greatest difference between the performance of one fund and another.

Yet another consideration is the large effect that fees have during times of lower market performance. If most funds in a particular category yield a rate of return of only four per cent one year, a one or two per cent difference in management fees — plus any sales fees — can make an even more significant difference.

How One Per Cent Makes a \$230,000 Difference

It's true that just a one per cent difference in management fees can mean a difference of literally hundreds of thousands of dollars.

Consider a person who contributes \$830 a month to an RRSP, or \$9,960 a year. This investor contributes the same amount for 30 years and gets an average annual return of 10 per cent. If the management fee is two per cent — still low, compared with the industry norm — this person would accu-

mulate a nest egg of about \$1.13 million. But if the management fee is one per cent — the maximum fee for the CDA RSP's non-international funds — the same investment would result in a nest egg of more than \$1.36 million. That's a difference of about \$230,000. Change this example to the maximum allowable RRSP contribution limit, up the difference in management fees from one per cent to two per cent, and suddenly you're looking at a difference of over half a million dollars at retirement time.

Service fees also take their toll. You have to find out what it costs to transfer money from one fund to another. The CDA RSP does not charge for such transactions, but many other RRSPs do. Brokers often charge processing fees, salespeople often charge switch fees, and many funds charge trans-

fer fees. An investor could have no-load funds, then switch money between two funds and end up with a charge equal to a one or two per cent load anyway.

Low Fees and the CDA RSP

All dentists understand the advantages of purchasing their professional associations' specially designed insurance plans, but not all dentists realize the benefits of joining the CDA retirement savings plan. Low management fees and no sales or service fees are key advantages that the CDA RSP has over other RRSP choices.

The CDA RSP — owned by the Canadian Dental Association and administered by Canadian Dental Service Plans Inc. (CDSPI) — can keep fees to a minimum because CDSPI is a non-profit organization. The plan is not run to make a

profit, but to benefit dental professionals and their families. That's why there are no sales fees, no charges for joining the RRSP, and no transaction charges, and it's why the CDA RSP's management fees are likely the lowest you'll find anywhere. Many financial experts describe the best RRSP buy as a no-load fund with a low management fee — and that, of course, describes the CDA RSP.

It's important to your retirement planning to understand the full consequences of fees on your nest egg. Once you do, then you'll understand why many investors make fees one of their most important criteria for selecting an RRSP. Always remember, when you're looking at a difference of one per cent, you're looking at a difference of more than a couple hundred thousand dollars. ■

CDA RETIREMENT SAVINGS PLAN

✓ Check Out Superior Investment Performance

CDA Fund Performance (for periods ending October 31, 1995)[†]
(Checks indicate Superior Performance Compared to Industry Averages*)

CDA Fund	1 Year		3 Year		5 Year		10 Year	
	CDA	Other*	CDA	Other*	CDA	Other*	CDA	Other*
Aggressive Equity	-3.7%	7.7%	n/a		n/a		n/a	
Common Stock	0.5%	4.5%	10.2%	11.5%	9.8%	10.3%	✓ 9.5%	8.1%
Balanced	8.4%	8.6%	7.8%	9.3%	9.8%	10.4%	✓ 9.2%	8.4%
Bond & Mortgage	12.4%	14.4%	✓ 7.4%	7.2%	✓ 10.9%	10.7%	✓ 10.1%	10.0%
Money Market	✓ 6.6%	6.0%	✓ 5.7%	5.0%	✓ 6.7%	6.3%	✓ 8.3%	7.9%
International Equity	✓ 6.3%	1.1%	n/a		n/a		n/a	
European	✓ 16.2%	5.8%	n/a		n/a		n/a	
Pacific Basin	✓ 4.0%	-10.7%	n/a		n/a		n/a	
Emerging Markets	✓ -21.0%	-23.0%	n/a		n/a		n/a	

[†] CDA figures indicate annual compound rate of return with all fees deducted. The figures are historic rates based on past performance and are not necessarily indicative of future performance.

* Comparison performance figures are Globe and Mail averages for the range of similar funds offered in the marketplace before sales charges, as published in the November 16, 1995 issue.

For current unit values and GIC rates call CDSPI toll-free at: 1-800-561-9401, ext. 525.
(Metro Toronto call: (416) 296-9401.)



What's Your

Periodontal disease is a leading cause of adult tooth loss. PSR, a new Periodontal Screening and Recording method, means early detection to reduce the risk and improve your patients' dental health.

Q Why has the CDA endorsed PSR?

A Preventative periodontal care is an important issue for Canadian dentists. As an integral part of our professional services program, the Canadian Dental Association and the Canadian Academy of Periodontology, with generous sponsorship from Procter and Gamble Inc., has created a series of seminars to introduce a new periodontal evaluation system that quickly screens patients for periodontal disease and records the results simply and easily. PSR is just one more way CDA is helping you enhance patient care and find new tools and techniques to support periodontal treatment.

Q How can I learn more about PSR?

A You and your staff can quickly learn more about this simple procedure at CDA's PSR Seminar. In addition to training by a periodontist appointed by the Canadian Academy of Periodontology, you'll receive a comprehensive starter kit. This kit includes recording stickers, helpful in-office marketing tools and background information that will help you integrate PSR into your practice and assist you with patient education.

Q How long does it take to perform PSR?

A Thanks to the special probe and simple scoring method, the procedure usually takes just 2-3 minutes. That's why it's easy to include PSR in all routine exams on adult patients.

What are the benefits for my patients?

1 Early detection

By evaluating all sites of potential risk, PSR is a highly sensitive technique that helps you detect periodontal diseases early to simplify treatment and offer patients greater peace of mind.

2 Speed

PSR takes just a few minutes to perform and can be added to routine exams without lengthening exam time.

3 Simplicity

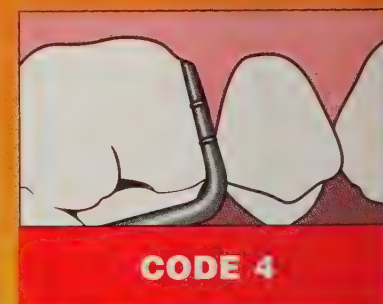
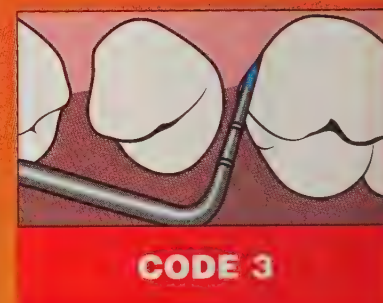
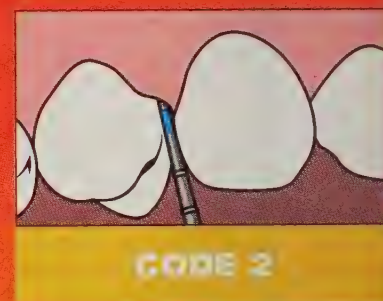
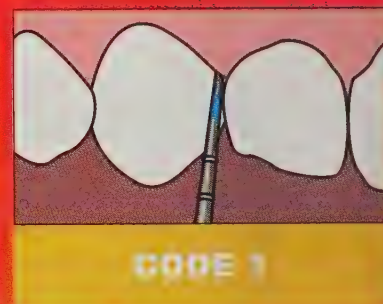
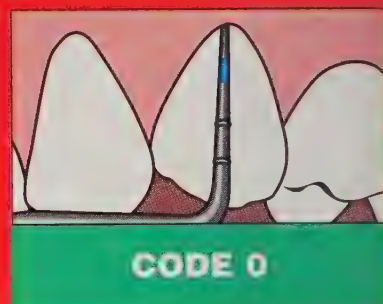
Easy to administer and understand, PSR and its simple scoring system can easily be explained to patients to enhance awareness.

4 Cost Effectiveness

By using a simple periodontal probe designed for the PSR method, there is no expensive equipment to buy. The specially designed probes are available from a variety of suppliers.

5 Recording Ease

PSR requires the recording of six scores, one for each sextant of the mouth. No extensive charting or narrative is required, which means more time for patient interaction.

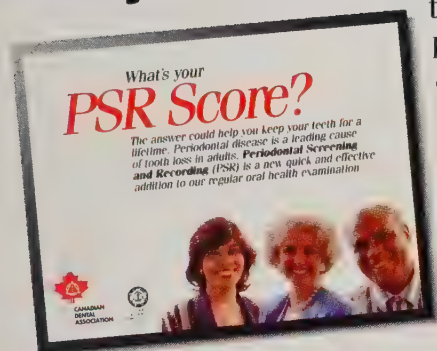


CANADIAN
DENTAL
ASSOCIATION

PSR Score?*



CDA's PSR Seminar makes early detection and recording simple and easy!



Through this seminar, you'll learn a fast and easy way to diagnose potential periodontal problems with the help of a specially designed colour-coded probe. You'll also learn how and when to advise periodontal care and when to schedule a full mouth periodontal examination and treatment planning.

Plan to join us today...

In order to introduce you to this essential periodontal diagnostic procedure, CDA has planned a number of seminars to be held in major centres across Canada. In addition to step-by-step training, dentists attending the seminar will receive a comprehensive PSR information kit.

But seating is limited, so don't delay. Complete and return the registration form below today or call 1-800-657-5688 and learn how the PSR program will help educate your patients about the risk of periodontal disease, simplify the recording process and save you time. Put PSR to work for you.

* Periodontal Screening and Recording, PSR, and the associated logotype are trademarks and servicemarks of the American Dental Association and related to a program jointly endorsed by the Canadian Dental Association and the Canadian Academy of Periodontology.

Sponsored by the makers of **Crest** & **PERIDEX**

PSR Seminars, Fall of 1995

Ottawa, ON (English)	November 2 1995	Peterborough, ON	November 30 1995	Trois-Rivières, QC (French)	December 14 1995
Sudbury, ON	November 2 1995	Toronto, ON	November 30 1995	Sherbrooke, QC (French)	December 14 1995
North York, ON	November 9 1995	Quebec City, QC (French)	November 30 1995	Chicoutimi, QC (French)	January 25 1996
Sault Ste Marie, ON	November 9 1995	Val D'Or, QC (French)	November 30 1995	St. John, NB	February 8 1996
Kelowna, BC	November 16 1995	Montreal, QC (French)	December 7 1995	Woodstock, ON	February 16 1996
Sydney, NS	November 16 1995	Rimouski, QC (French)	December 7 1995		

Registration Form

Seminar location: _____ Seminar date: _____
Pre-registration is required. There will be no on-site registrations.
Register early since enrollment is limited.

Name: _____

CDA Membership #: _____

Street: _____

City: _____

Prov.: _____

Postal Code: _____

Office Tel: _____

Residence Tel: _____

A receipt for the above registration fees will be issued to: _____

☐ Cheque made payable to the Canadian Dental Association is enclosed.
(no post-dated cheques) ☐ Visa ☐ MasterCard

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Allied staff or spouse of member dentist:	\$25	\$
Allied staff or spouse non-member:	\$35	\$
Subtotal		\$
GST 7% of Subtotal (#R106845209)		\$
Total		\$

Sign-in and light supper and refreshments at 6:30 pm.
Seminar presentation at 7:30 pm.

Register Today!

Mail or Fax registration form and payment to:
CDA Member Services, Canadian Dental Association
1815 Alta Vista Drive, Ottawa, ON K1G 3Y6
Call toll-free 1-800-657-5688 or fax 1-613-523-7736

CLINICAL



Le Fort 1 Downfracture Approach For the Treatment Of a Posterior Maxillary Ameloblastoma

Owen G. Symington, B.Sc., M.Sc., DDS

Marco F. Caminiti, DDS

ABSTRACT

The ameloblastoma is a slow-growing insidious tumor derived from the dental lamina. It may be described as locally invasive and clinically persistent, and it has high recurrence rates if adequate treatment is not rendered. From a clinical perspective, the maxillary ameloblastoma is considered to be more aggressive than its mandibular counterpart. This is because the maxillary bone is thin and more easily penetrated, and not because of a difference in biological behavior.

In the treatment of intraosseous multicystic or solid maxillary ameloblastomas, many authors stress the need for adequate access to achieve a proper surgical resection. This paper presents a case of maxillary ameloblastoma that was treated using a Le Fort 1 downfracture technique in combination with a segmental resection of the posterior part of the left maxilla.

The Le Fort 1 technique provided excellent access and visibility, especially on the medial aspect of the resection. No major problems were encountered with the technique.

Six months after the resection, the patient remained clinically and radiographically free of the tumor. The need for long-term follow-up is stressed.

SOMMAIRE

L'améloblastome est une tumeur insidieuse qui se développe lentement à partir de la lame dentaire. On peut le décrire comme une affection invasive et clinique-persistante dont le taux de récurrence est élevé si elle n'est pas traitée convenablement. Du point de vue clinique, l'améloblastome passe pour être plus agressif au maxillaire qu'à la mandibule parce que la structure osseuse du maxillaire est mince et plus pénétrable et non parce qu'il y a une différence dans le comportement biologique.

Pour le traitement des améloblastomes multikystiques intra-osseux ou maxillaires solides, de nombreux auteurs soulignent qu'il faut un accès convenable pour bien opérer une résection. Dans cet article, on présente un cas d'améloblastome maxillaire traité suivant la technique de fracture de Le Fort 1 conjointement avec une résection segmentaire de la partie postérieure du maxillaire gauche.

La fracture de Le Fort 1 a donné une visibilité et un accès excellents, surtout pour l'aspect médial de la résection. Avec cette technique, il n'y a eu aucun problème majeur.

Six mois après la résection, un examen clinique et des radiographies n'ont révélé aucune tumeur.

Cependant, on souligne l'importance d'un suivi à longue échéance.

Introduction

The ameloblastoma is a slow-growing, histologically-benign tumor. It has been reported to arise from derivations of the dental lamina such as epithelial rests, the epithelial lining of odontogenic cysts, the basal cells of surface epithelium, and other anlage remnants, e.g. cranio-pharyngioma.¹

Ameloblastomas have been described as locally invasive and clinically persistent. This is due to the tumor's ability, when left untreated, to invade local tissues and surrounding structures, as well as its typically high recurrence rates.

Approximately one per cent of the cysts and tumors of the jaws are ameloblastomas.² The tumor has a frequency of occurrence of 80 to 94 per cent in the mandible, and of six to 20 per cent in the maxilla.^{3,4}

In the mandible, ameloblastomas have a predilection for the molar and ramus areas. They occur in these regions in 70 per cent of cases, and in the premolar and symphyseal areas in 20 and 10 per cent of cases, respectively.⁵ Similar site predilection occurs in the maxilla, with 47 per cent of ameloblastomas occupying the



Fig. 1: Ameloblastoma extending into the buccal unattached gingiva from the distal of tooth 27 posteriorly.

molar area, 33 per cent the antrum and floor of nose, 18 per cent the premolar/canine region, and only two per cent the palate.⁶

Most patients present in their fourth decade (average age 33 years), although the tumor has been diagnosed in patients as young as two months and as old as 80 years.⁶ More than 50 per cent of ameloblastomas occur between the ages of 20 and 50 years, however.⁷

There appears to be an equal distribution of the tumor between males and females. While most authors have found no predominance in any particular race, Small and Waldron⁵ have reported that blacks are more commonly affected by ameloblastomas than whites.

The histological features of ameloblastomas have been reviewed by several authors.^{2,5,8} Histologically, the tumor consists of cords or islands of epithelium with peripheral columnar cells. Palisaded nuclei are polarized away from the basement membrane and surround a central area of stellate reticulum-like tissue, which is prone to microcyst degeneration. Although several histological variants have been identified (plexiform, follicular, acanthomatous, basal and granular cell types), no differences in clinical behavior have been attributed to any one of them.

Clinical Presentation and Biological Behavior

Either clinically or during gross examination of the specimen, ameloblastoma can be divided into three types:

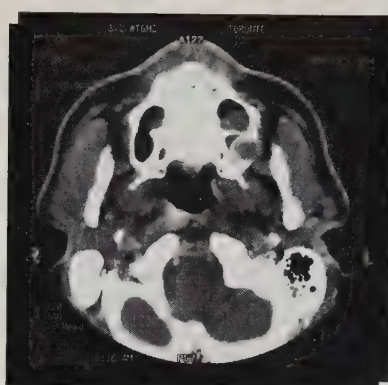


Fig. 2: Axial CT scan shows the perforation of the left lateral maxillary alveolus and the expansion of the sinus floor.

1. solid intraosseous or multicystic,
2. well circumscribed unicystic; or
3. peripheral extraosseous.

Of the three, the solid intraosseous or multicystic type is the most common and also the most invasive, with a potentially higher recurrence rate than either the unicystic or the peripheral extraosseous types.^{2,7} This review will deal primarily with the biological and clinical behavior of the solid intraosseous or multicystic ameloblastoma.

The typical ameloblastoma begins as a central lesion in bone. It grows slowly, destroying the bone in its path. The tumor tends to expand bone before it perforates. As a result, it invades trabecular cancellous bone easily, but does not invade cortical bone.⁹ When the tumor reaches cortical bone it must actually erode through the bone. The fact that an intraosseous multicystic ameloblastoma can invade cancellous bone means that the tumor extends beyond the radiographic and clinical margins. Carlson¹⁰ states that the maximum invasion of the ameloblastoma past its clinical margins is 7.0 mm. One centimetre margins, therefore, would be sufficient in a resection. Although Gold¹¹ states that 3.0 cm margins are required, he provides no histological proof that the tumor can extend this far past a clinical margin. Currently, most surgeons treating ameloblastomas recommend a 1.0 cm to 1.5 cm margin in the bone and overlying soft tissue if the tumor has perforated the bone.

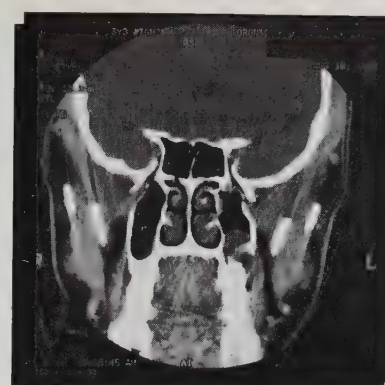


Fig. 3: Coronal CT scan shows the expansion of the tumor into the posterior part of the sinus and the lateral destruction of bone. Also seen is a mucus retention cyst.

The ameloblastoma is seldom painful unless it is accompanied by a secondary infection. Signs and symptoms of nerve involvement are rare. Loose teeth in the area of the tumor are quite common, however, as is the propensity for the tumor to resorb the roots of teeth. Struthers and Shear¹² found root resorption of associated teeth in 81 per cent of a series of 32 cases of ameloblastoma. By way of contrast, this phenomenon was observed in only 55 per cent of 20 cases of dentigerous cyst, and 18 per cent of 33 cases involving apical periodontal cysts.

Radiographic Features

Radiographically, the ameloblastoma has been described as a multicystic or unilocular lesion that is radiolucent, with or without septa of bone extending into the tumor mass. The periphery of the lesion is usually smooth and may be corticated. Expansion and thinning of the cortical plates is common, as is erosion of the inferior border of the mandible.

Similar radiographic features may be seen in the maxilla. However, because of the thin cortical plates, and the fact that perforation occurs earlier in the maxilla than in the mandible, there may be less expansion.

Maxillary ameloblastomas are inherently more difficult to treat and are considered to be more aggressive than mandibular ameloblastomas. The two tumors are indistinguishable, although the granular cell type may be less commonly found in the maxilla.

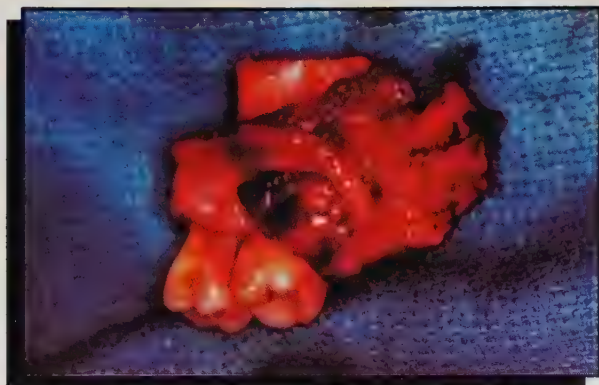


Fig. 4: Surgical specimen that included the socket of tooth 26 and the pterygoid plates.

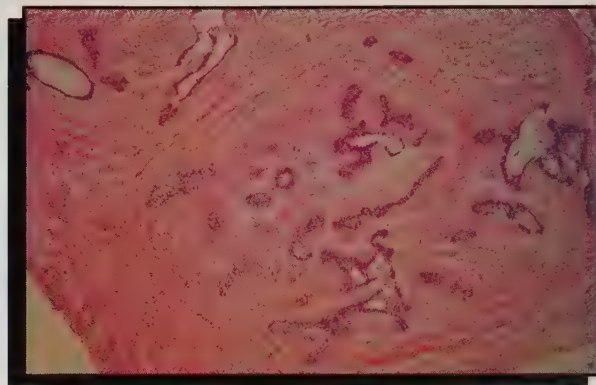


Fig 5: Histopathology of the tumor (H&E stain). Original magnification x 40.

Maxillary and mandibular ameloblastomas also exhibit the same biological behavior.¹³ The difference lies in the anatomic boundaries confining the tumor. While the mandible has thick cortical boundaries, the maxilla has only thin walls, and is adjacent to more vital structures as the orbit and cranial base.

Treatment

Intraosseous ameloblastomas are usually treated surgically by using one or more of three methods:

1. curettage;
2. marginal resection; or
3. segmental resection.

Curettage and enucleation are only effective against unicystic ameloblastomas. If this treatment modality is chosen for the removal of a unicystic-type tumor, the surgeon and pathologist must examine the whole specimen to ensure that the tumor cells and growth are confined to the cyst lining or the lumen of the cyst. Muller and Slootweg¹⁴ have shown that the recurrence rate for such unicystic ameloblastomas is 20 per cent. This approaches the 15 per cent recurrence rate for the multicystic variant following radical resection. Curettage of multicystic or solid ameloblastomas results in a recurrence rate up to 90 per cent.¹

Radiotherapy is generally considered to be inappropriate for operable ameloblastomas, because they are radio-resistant. Gardner's¹⁵ review points out the lack of studies to accurately evaluate the sensitivity of the ameloblastoma to modern radiotherapy techniques. Radiotherapy should

therefore be reserved for those patients who are unable or unwilling to undergo surgery. The best outcome that these patients can expect is a cessation of the tumor's growth, and most of them will die from the disease.

In 1867, Cheevers described a hemi Le Fort 1 osteotomy and then an osteotomy resembling a Le Fort 1 downfracture.¹⁶ He used both of these approaches as a maxillotomy, allowing tumors of the maxillary sinuses to be removed. Similarly, in 1987, a new transclival approach was described¹⁷ in which a Le Fort 1 downfracture was used to create improved access for the treatment of basilar artery aneurysms. A single-fragment maxillotomy does not always allow adequate access to deeper structures, however, and a midline split of the hard and soft palate may be employed in these situations.¹⁸

Follow-Up and Prognosis

The follow-up and prognosis of patients with ameloblastoma are closely related. In most patients (95 per cent),¹⁴ recurrent ameloblastoma is observed within five years. This is likely to occur even earlier if the tumor was treated by curettage. Adekeye and Lavery¹⁹ reported on 21 recurrent ameloblastomas. They found an average of 7.5 years between the primary operation and the secondary procedure, with a range of one to 23 years. This is in agreement with Muller and Slootweg,¹⁴ who studied 84 cases where recurrent ameloblastoma was observed

within one to 25 years. Only five per cent of these cases recurred after five years.

The importance of long-term radiographic and clinical follow-up is self evident. Although the prognosis of patients with ameloblastoma has been poorly reported, it is generally considered to be good with the provision of adequate surgery. The prognosis for mandibular lesions is better than for those located in the maxilla.

Tskanis and Nelson¹³ studied 24 patients with maxillary ameloblastoma, two of whom died. In a similar study, two of 20 patients died.¹⁷ Another study on invasive maxillary ameloblastomas reported that three of six patients died, and that none of them were free of disease. The average survival rate in this study was eight years, with a range of four to 15 years.²¹

Case Report

A 49-year-old Caucasian male was referred with a chief complaint of swelling and a slight ache in his posterior left maxilla. The patient's history revealed that he had noticed a swelling on the buccal surface of the maxilla in the unattached gingiva approximately five months previously. Two weeks prior to presentation, the patient's lesion was biopsied by his family dentist, who sent the specimen for histopathological examination by the oral pathology department at the University of Toronto. A diagnosis of ameloblastoma was made.

A medical history revealed that the patient had undergone a right nephrectomy in 1991 for a benign

tumor, and that he had an allergy to ASA. The patient was otherwise healthy.

An extraoral physical examination revealed no significant findings. However, the intraoral examination showed a 2.5 x 1.5 cm broad-based mass, reddish brown in color, extending into the buccal unattached gingiva from the distal of tooth 27 posteriorly (**Fig. 1**). The mass was firm to palpation, nontender, and seemed to extend from the deep tissues.

A computerized tomography (CT) scan of the head revealed a radiolucent soft-tissue lesion arising from the posterior portion of the left maxillary alveolus, causing elevation of the floor of the left maxillary antrum (**Figs. 2 and 3**). On the lateral aspect of the maxilla, the cortical bone had been eroded and it was perforated distal to tooth 27. The lesion had well defined margins, suggesting a slow-growing lesion. In addition, soft-tissue thickening of both maxillary sinuses was noted, as was a mucous retention cyst in the left maxillary sinus.

During surgery, a standard Le Fort 1 incision was made extending from the zygomatic process on the right side to the zygomatic process on the left. On the left side, the incision was kept 1.5 cm above and 1.0 cm anterior to the tumor. The periosteum and overlying muscle were then stripped off the maxilla to reveal the posterior, lateral and anterior surfaces of the maxilla. The bone cuts in the maxilla were then marked out and four Timesh plates were adapted and screwed to the maxilla in the area of the zygomatic buttress and piriform rims, to straddle the proposed bony cuts. The plates were then removed and placed aside, the bony cuts were made, and the Le Fort 1 downfracture completed.

The downfracture of the maxilla provided excellent access to the tumor. At this point, the tumor could be seen extending across the sinus floor to within 1.0 cm of the greater palatine canal. To achieve at least 1.0 cm bony margins, the resection of the maxilla was extended from the mesial of the socket of tooth 26 to the posterior of the maxilla, and included the medial sinus wall and the greater

palatine canal. The greater palatine artery was ligated and sectioned in the usual manner prior to the resection. On the buccal and posterior surface, 1.5 cm soft tissue margins were taken. All soft tissue margins were sent for frozen quick section at the time of surgery and found to be clear of tumor.

Following excision of the tumor (**Fig. 4**), the maxilla was placed back into position using the pre-drilled holes and shaped timesh plates. Primary closure was achieved in the area of the resection without the need of any advancement flaps. Histopathology confirmed the initial diagnosis (**Fig. 5**).

The postoperative course was uneventful. A minor occlusal discrepancy was treated with elastic traction and resolved within two weeks.

At six-month follow-up, the area remained completely healed with no clinical or radiographic evidence of recurrence. The patient was informed of the reasons and need for long-term follow-up, and will be followed for the remainder of his life.

Discussion

When reviewing the literature, there may be some confusion with regard to the behavior and treatment of ameloblastoma. The true unicystic ameloblastoma described and classified by

Ackermann et al,²² with no growth of tumor beyond the cyst lining, is the only form of ameloblastoma that can be safely and predictably treated by curettage.

The terminology used to describe the types of available treatment can also be confusing. In general, the definitions laid down by Gardner and Pecak²³ have been used because they avoid terms such as radical or conservative, which tend to be vague and do not communicate an accurate picture of how radical or how conservative a surgical procedure really is.

Based on these definitions, curettage is the scraping of the wall of a cavity within soft tissue or bone for the removal of its contents. Enucleation is the removal of a lesion by shelling it out intact. Marginal resection (Block or En-bloc resection) is the surgical removal of a tumor intact including

a margin of healthy tissue, but still maintaining the continuity of the structure. Segmental resection is the removal of a tumor and margins of healthy tissue in a manner that produces a continuity defect in the bone.

The importance of adequate access to surgically remove a tumor cannot be overstated. In this case, the Le Fort 1 downfracture technique was chosen to gain access and allow for the visualization of the medial extent of the tumor. The alternative technique — using an intraoral partial maxillectomy — would not have allowed control of the greater palatine artery or good visualization of the medial extent of the tumor. The Le Fort 1 procedure allowed excellent access and visibility of the tumor in all directions, and facilitated the easy segmental resection of the posterior left maxilla including the pterygoid plates. Because of the medial access, control over the greater palatine neurovascular bundle was achieved and hemorrhage was kept to a minimum.

As all oral and maxillofacial surgeons are intimately familiar and comfortable with the Le Fort 1 downfracture technique. This approach can therefore be accomplished rapidly. In addition, simple and accurate closure can be achieved by pre-bending the plates and drilling the holes for rigid fixation prior to creating the osteotomy cuts.

Complications arising from a Le Fort 1 osteotomy are minimal. Infection rates and the possibility of hemorrhage intra- or postoperatively are very low.²⁴ The minor complication in this case was the development of an occlusal discrepancy, which was easily corrected with elastic traction over two weeks.

Due to the anatomical differences in the bone of the maxilla and mandible, the maxillary ameloblastoma must be approached more aggressively. Since the tumor is benign, it does not rely on a field change for recurrence within a similar area, as squamous cell carcinoma may do. Most recurrences are probably the result of inadequate removal. Therefore, the best chance for a surgical cure occurs at the time of

the first operation. This is illustrated by the poor prognosis (59 per cent mortality) of recurrent ameloblastomas of the maxilla reported by Bredenkemp et al.²¹

The slow insidious growth of the ameloblastoma emphasizes the need for regular dental check-ups, as a patient may be unaware of the problem. Globally, on average, it takes six years from the discovery of an ameloblastoma before diagnosis and treatment occur.⁴ This time interval is clearly biased, however, because in some third-world countries ameloblastomas may reach gigantic proportions before treatment is sought.

Conclusion

Although the Le Fort 1 down-fracture was first devised as a method for approaching a tumor of the maxillary sinus, this report appears to provide the first description of the technique for the removal of a maxillary ameloblastoma. In the case reported, excellent visualization of the tumor and surrounding tissues was obtained, and hemorrhage could be controlled by applying clips to the greater palatine artery prior to the segmental resection. The accuracy

and control afforded by this approach makes it worthy of consideration for the removal of benign tumors of the posterior part of the maxilla. ■

Dr. Symington is in private practice, oral and maxillofacial surgery in Toronto.

Dr. Caminiti is a resident of oral and maxillofacial surgery at Toronto Hospital, and the faculty of dentistry, University of Toronto.

Reprint requests to: Dr. O.G. Symington, 421 Bloor St. E., Suite 207, Toronto, Ont. M4W 3T1

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We asked you and this is what you've told us

After the CDA 1995 Convention in Ottawa, the Convention department sent out a post-meeting survey to a random selection of 3,500 dentists. We have received an overwhelming response to this survey. Over 1,200 (35%) of the surveys were returned! They were full of great comments and suggestions and represented a good selection of dentists from each region of Canada. Your response has given us great insight into the kind of convention you would like to attend. Here's a preliminary look at what you've told us (approximate figures):

The survey, first of all gave us valuable information on our participants and their personal profiles. We found that the annual convention attracts new participants while maintaining the support of those who attend on a more regular basis. Of those who attended the Convention, 23% of the respondents said it was their first time, while 36% attend every year or almost every year and 40% attend less frequently. 91% of the dentists were general practitioners and the remaining 9% were specialists. In addition, 68% of respondent participants attended the CDA Convention for 2 - 3 days.

The Convention is not only designed for dentists but for dental team members as well. While 60% of those who attended were from Ontario and 40% were from the rest of Canada, 42% of respondents brought their dental staff to Ottawa. The dental professionals of Canada are serious enough about the Annual Convention to travel across Canada and bring their staff with them.

The survey also educated us in determining how important various aspects of the Convention are to our participants. An overwhelming number of respondents, 94%, felt that the CDA membership benefit of free registration to the Convention was very important or important to them. The majority of respondents, 88%, told us that the exhibit hall was a very important or important part of the CDA Convention. The opportunity to obtain Continuing Education Credits in the scientific program is very important or important to 78% of those who responded to the survey.

A lot of effort is put into planning the scientific program and other auxiliary events of the Convention. We are pleased to find that 94% rated the general scientific program to be excellent or good. As well, the pre-convention courses designed to give in-depth study into a specific topic were rated excellent or good by 85% of survey respondents.

The Convention is not just about work, but also about socializing and meeting with your peers. We aim to give you these opportunities through our social program. A great majority, 88%, enjoyed the Opening Ceremony and rated it as excellent or good. The other social events that took place during the Convention were given 80% approval as excellent or good.

The exhibit hall is a very crucial part of each CDA Convention. When you visit the exhibit hall 86% of you visited on Monday and 60% of you visited on Tuesday. The average time spent in the exhibit hall was 2 hours per day. Overall, 87% of you rated the exhibit hall as excellent or good.

An important part of the survey to us was to find out what you were thinking about your national convention and to receive feedback from you in the form of comments and suggestions. Some of you think that the meeting is great as it is and you especially like the variety found in the scientific program. Others would like to see more Canadian content in our selection of speakers, more lectures given in French and more general interest topics on health and nutrition.

Lastly, the survey told us that 64% of you plan to return next year for the CDA 1996 Convention. We are very excited about being in Montréal and hope that as many as possible can be with us from August 17 - 20.

Although the survey is over (and by the way, 3 - 4 surveys a day are still trickling in!) we would encourage you to continue sending us this useful information so that we can plan future conventions with your needs in mind.

We are grateful to each participant, thank you for your input.

Have safe and happy holidays! We'll see you in the new year.

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Excitement...

From May to October, Montréal becomes a "Festival City" with events closely following one another — The International Jazz Festival, the Just for Laughs Festival, the International Fireworks Competition, the World Film Festival and Francofolies. As part of its exciting and vibrant nightlife, the city offers an extravaganza of top-notch live entertainment. There is never a lack of things to do in the city that never sleeps!

Cuisine...

Montréal has earned a reputation as a gastronomic haven, equal to any European city. From French haute cuisine to Sushi or the delights of Middle Eastern cuisines, the roots of Montréal cooking are highly eclectic. During the summer months, sunny terraces and sidewalk cafés as well as chic restaurants and bistros provide a perfect place to sample dishes from the more than 75 distinct types of cuisine offered in the city.

Culture...

Montréal is the only North American city with a French flavor. With a history dating back over 350 years, Montréal is not only a bustling contemporary city but its "old" quarters attest to the realities of times past. The city is home to a variety of museums which have excellent permanent collections in addition to world-renowned short-term exhibitions.

Music and Arts...

Montréal boasts of a world class symphony and opera, theatres and cabarets with shows in both French and English, and a cultural centre, Place des Arts, which has five halls with almost continuous activity. Even those who prefer more upbeat contemporary music (rave, reggae, rap or pop) will find what they're looking for in one of the many bars and night clubs that stay open to the wee hours of the morning.



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The CDA has designed several seminars jointly with foreign dental associations so that dentist members may have the opportunity to see dentistry in other parts of the world. This month we are featuring the 1996 tour to Egypt. The following descriptions are only highlights.

the Kings. Visit also the Valley of the Queens and admire detailed frescos of ancient life in the Valley of the Nobles.

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OF INTEREST ...

The Great Sphinx, with its human head and lion's body, is a stone statue dating back to 2600 BC. Ancient Egyptians envisioned their kings with wide-open staring eyes and the lion's body symbolized courage. The head of the sphinx measures 19 feet and is 91 feet in circumference. The upper portion of the paws extend 56 feet, the body is 172 feet in length and the top of the head reaches 66 feet. Quite a carving for primitive tools!

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The largest pyramid ever built is the Great Pyramid from the 26th Century BC. There are many theories as to how the Great Pyramid was built. One theory estimates that 100,000 men laboured for 20 years and 2.3 million stone blocks were used in its construction! Amazingly, it is the only one of the Seven Wonders of the World that still exists.

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Egypt	March 1 - 10
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CLINICAL



Tori Mandibularis: A Case Report and Review Of the Literature

Bruce R. Pynn, M.Sc., DDS

Natalie S. Kuryk-Kos, B.Sc., DDS

David A. Walker, DDS, M.Sc., FRCD(C)

John T. Mayhall, DDS, PhD

ABSTRACT

Many dentists have patients in their practice with mandibular exostoses, termed torus mandibularis. The majority of these asymptomatic, benign bony outgrowths remain undisturbed over the patient's lifetime. However, the tori occasionally need to be removed. The differential diagnosis for the tori are discussed as well as the indications and techniques for their removal. Various hypotheses concerning the etiology and epidemiology of torus mandibularis are also reviewed.

SOMMAIRE

De nombreux dentistes ont des patients ayant une exostose à la mandibule, c'est-à-dire un torus mandibularis. Dans la majorité des cas, ces excroissances osseuses sont bénignes et asymptomatiques, restant telles quelles durant toute la vie du patient. Parfois, cependant, une extraction s'impose. Dans cet article, on explique le diagnostic différentiel du torus mandibularis et on indique les techniques pour l'extraire. De plus, on examine les différentes hypothèses touchant l'étiologie et l'épidémiologie de cette malformation.

Introduction

Torus mandibularis (TM) is a hyperostosis located on the lingual surface of the mandibular body. They generally occur in the premolar region, but sometimes extend distally to the third molar and mesially to the lateral incisor. When present, they are always located above the mylohyoid line but below the alveolar margin.^{1,2} These developmental anomalies or hamartomas possess little or no pathologic significance, although there may be indications for their removal (Table I).

Clinically, TM may occur in varying shapes, from a single tubercle to multiple fused or separate tubercles of variable sizes (Fig. 1). They usually present as well rounded, smooth surfaced, hard bony projections, covered with normal or blanched mucosa. The differential diagnosis for a swelling on the lingual aspect of the mandible should include:

1. abscess formation,
2. neoplasm of bone,
3. salivary gland neoplasm, and
4. vascular tumor.³

Routine diagnostic tests such as palpation, vitality testing, aspiration, evaluation of mucosa color and radiographs will aid in eliminating possible pathoses. Radiographically, TMs present as well circumscribed areas of high radiopacity superimposed on the roots of the mandibular teeth. On rare occasions, lesions such as cementifying or ossifying fibroma, ossified subperiosteal hematoma, osteoma, unresolved bony callus, and osteosarcoma in the early stages of development may resemble TM, both clinically and radiographically. Microscopic examination of the hyperostosis reveals cortical and cancellous bone, with a thickened outer cortical plate of Haversian bone.⁴ Medullary trabeculae extend internally and are admixed with intervening fibroadipose marrow.

TM is rare in children, but up to 10 per cent of the adult North American population may be affected.^{5,6} The highest frequency of TM is seen in peoples of the far North (50 to 90 per cent).⁷⁻⁹ TM usually occurs bilaterally, but 20 per cent of the TM population may present with unilateral tori. As previously mentioned, the tori can be single or multiple. A study of dental patients by Kolas et al⁵ showed that the most common type of presentation was single bilateral TM. Hrdlicka¹ suggested that TMs continue to grow in size until senility, at which point they are thought to stabilize. Kolas et al⁵ also found a levelling off of TMs in the third decade of life. However,

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Table I

Indications for Tori Removal

1. Traumatic ulcers from mastication
2. Prosthodontic considerations
3. Cancer phobia
4. Interference with tongue function during mastication
5. Interference with normal speech

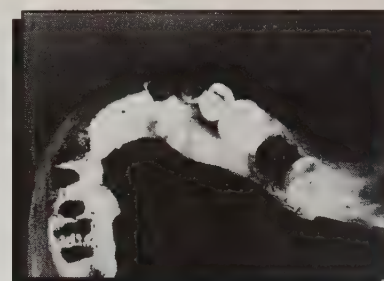
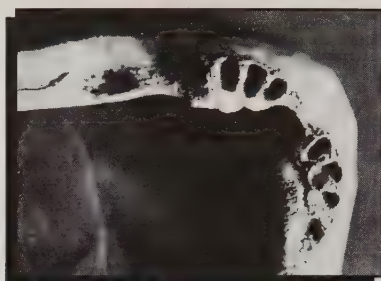
Muller and Mayhall¹⁰ found that TMs continued to proliferate in a Canadian Inuit population. This is in contrast to other researchers, who found a minor decrease in prevalence with advancing age.⁶

The incidence of TM varies among races (**Table II**). Kolas et al⁵ demonstrated a low frequency in negroids, and Sellevold⁹ has shown a high frequency in mongoloids and a low frequency in caucasoids.

Hrdlicka¹ demonstrated that males have a higher incidence of tori than females. This was supported by Ossenberg,² who reviewed 45 population samples and found that a minority of samples had a higher female incidence, and that there was definitely a general preponderance of males in the series. Although the etiology of TM is unknown, three major hypotheses, which are not mutually exclusive, have been proposed:

1. hereditary predisposition;
2. functional reaction to masticatory stresses; and
3. environmental influences.

Of all the theories, the hereditary hypothesis is the leading and best accepted one. Most researchers today believe that the presence of TM follows a genetic pattern, most probably one of dominant inheritance. Suzuki and Sakai¹¹ observed that when one or both parents have TM, its frequency in children is greater than if neither parent expresses the trait. The same study showed a genetic pattern in the degree of TM expression. Children whose parents have



Figs. 1a and 1b: Thule culture (900-1650 a.d.) mandible from west coast of Hudson Bay demonstrating variation in TM.

a large expression of TM typically have a high frequency of occurrence.

Sellevold⁹ found that two different racial groups (Eskimos and Norsemen), despite sharing the same physical environment, showed different morphologies of TM, particularly in its degree of development, its position and length, and its surface morphology. Ossenberg² cautions that evidence of strong extrinsic influences on torus development precludes the use of tori for assessing genetic relationships between populations. She feels that the genetic influences of TM are indirect, and that they are brought about primarily through tooth and jaw morphology, and therefore occlusion.

Some researchers believe that masticatory stress associated with occlusal load stimulates the growth of TM. A study of dental patients in Norway¹² concluded that patients with mandibular tori had, on average, more teeth present than those without TM. This suggested that the functional forces of teeth are required to maintain TM.

A later study by Eggen and Natvig¹³ found a decreasing prevalence of TM in persons over 50 years of age due to the decreasing number of teeth remaining in that age group. The same study noted that women have fewer mandibular tori than men, primarily because men have a "stronger biting force" than women, and women have fewer teeth present than men.

Johnson¹⁴ and Eggen and Natvig¹² observed a relationship between facial structure and the

presence of mandibular tori. Both studies found that a person with TM has well developed facial features with a strongly developed mandible.

Ramfjord and Ash¹⁵ reported that patients suffering from bruxism had a high number of TMs. This hypothesis is summarized by Ossenberg² who states: "Age, sex, and side differences, population distribution, association with other oral hyperostoses and clinical evidence all support the hypothesis that one essential factor underlying the formation of mandibular torus is masticatory stress. The mechanism proposed is that horizontal forces tip the lower teeth, first molar to canine, so that their root apices exert pressure on the periodontal ligament, causing formation of new bone on the outer cortical plate of the alveolar process on its lingual surface."

Yet a third school of thought is centred around the idea that the environment induces the formation of mandibular tori. It has been suggested that populations subsisting on a rough-type diet will have a greater incidence of TM. Studies of Northern populations have shown that people who consume a coarse diet have a higher incidence of mandibular tori than those who consume a soft diet.^{16,17}

Hrdlicka¹ believed that the TM gene exists in everyone, and that the environment ultimately determines the expression or dormancy of the trait. By way of contrast, Sofaer¹⁸ postulated a "threshold" for the expression of TM. In fact, he believed that heredity determines the presence or absence of mandibular tori and morphology, while the environment determines



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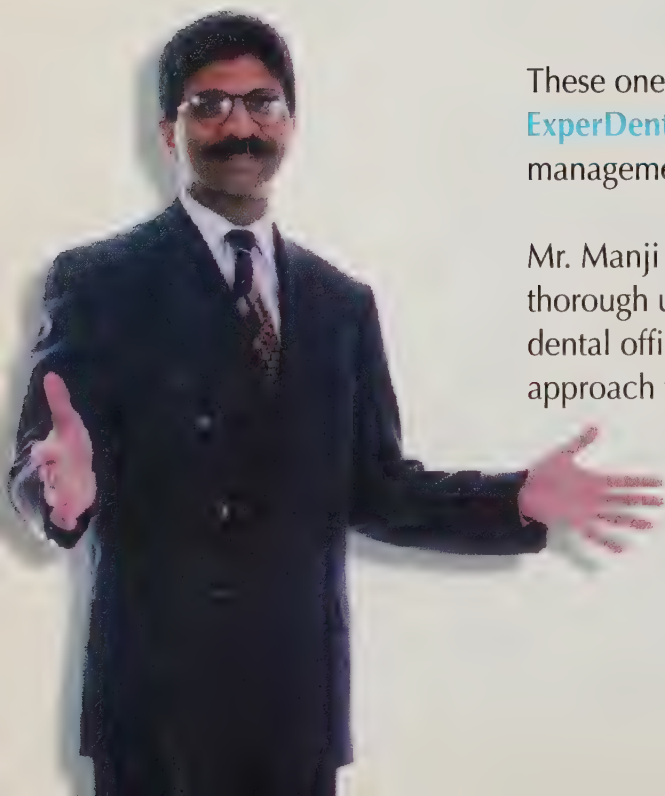
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Table II**Prevalence Rates Of Mandibular Tori In Living Populations***

Author	Year	Population	No. examined	Per cent
Drennen ²²	1937	Bushmen	78	27
Hrdlicka ¹	1940	Indians,	2,000	14
		American whites,	766	6
		Negroes	53	11
Kolas et al ⁵	1953	U.S.A. whites	2,478	8
Moorrees et al ⁸	1952	Western Aleuts	35	26
		Eastern Aleuts	44	61
Summers ²³	1968	U.S.A. white females	300	16
Mayhall et al ¹⁶	1970	Alaskan Eskimos	86	20
Schaumann et al ⁶	1970	U.S.A. blacks	557	10
Mayhall & Mayhall ¹⁷	1971	Canadian Eskimos	208	64
Alvesalo & Kari ²⁴	1972	Finns, Hailuoto	400	14
Sellevold ⁹	1980	Norsemen	53	100
		Greenland Eskimos	93	100
Axelsson & Hede- gard ²⁵	1981	Icelanders, children	976	27
Yaacob et al ²⁶	1982	Malaysian	1,044	3
		Chinese	600	1
		Indian	710	2
Volchansky ¹⁷	1986	White South Africans	436	16
Reichart et al ²⁸	1988	Germans	1,317	5
		Thai	947	9
Eggen & Natvig ¹³	1991	North Norway	1,171	13
		Inland Norway	829	27
Haugen ²⁹	1992	Norway	5,000	7

*After Ossenberg, 1981

whether the threshold for expression will be exceeded. Eggen,¹² studying a sample of Norwegians, stated that 30 per cent of TM expression was related to genetic expression, and 70 per cent to environmental influences resulting in occlusal stress.

It seems clear that there is no unanimity about the "causes" of TM, its incidence or expression. Its relationship to other hyperostoses is also unclear.

Case Report and Technique Of Removing Tori Mandibularis

A healthy 41-year-old female was referred to the oral and maxillofacial surgery division of Toronto

Hospital by her family dentist for the removal of large bilateral mandibular tori. Removal was required to facilitate the fabrication of new crowns on her molar teeth (Figs. 2a and 2b). The patient was admitted to hospital, taken to the operating room, and anesthetized via the nasoendotracheal route. Her throat was packed and the surgical site was infiltrated with local anesthetic.

Beginning on one side, a lingual circumdental incision was made from the molar to the incisor area. Using a periosteal elevator, the mucoperiosteal flap was carefully reflected inferiorly below the tori (Fig. 3).

Small tori may be simply removed with a mallet and chisel or

bur technique. Because larger tori were involved in this case, however, before removal was accomplished with a mallet and chisel a cleavage plane was started by placing a groove on the superior aspect with a 702 bur. Several transverse cuts were also made to create three separate sections, and ease the removal of the tori (Fig. 4). Finally, with adequate soft tissue protection in place, a single swift stroke of the mallet on the chisel allowed the tori sections to be efficiently removed.

Once the bulk of the tori had been removed, the area was smoothed with a large round bur or hand rasp under copious saline lavage, and inspected both visually and digitally for smoothness



Fig. 2a: Birds-eye view of large bilateral tori.



Fig. 2b: Relationship of tori with tongue.



Fig. 3: Elevated mucoperiosteal flap, exposing the large tri-lobed tori.



Fig. 4: Transverse cuts in tori.



Fig. 5: Tori site inspected for smoothness (compare to Fig. 3).

(Fig. 5). The surgical site was then thoroughly irrigated to remove bone chips or debris, and the mucosa was re-approximated with interrupted gut sutures (Fig. 6). The identical procedure was then performed on the opposite side.

The total blood loss was less than 50 cc. The patient was extubated and transported to the recovery room in stable condition. Her postoperative course was uneventful and she was discharged the following day. The patient has followed through with prosthetic dentistry, and has had no problems during a three-year follow-up (Fig. 7).

Several additional surgical points should be noted when removing TM. Extra care must be used when elevating the mucoperiosteal flaps as the mucosa is thin and friable. Also, the incision should not cross the midline if bilateral tori are being removed, for two reasons. First, it may compro-

mise the blood supply to the lingual gingiva and, second, the muscle tension (from the tongue musculature) may cause dehiscence of the repositioned flap. A surgical stent could also be used to assist in the reapproximation. The excess tissue in the mucoperiosteal flap will usually remodel over time. With larger tori, however, excision of the mid portion of the soft tissue "sac" with direct suturing is acceptable as long as this does not create vascular compromise. Large tori can also be removed with the reciprocating saw in a controlled removal. This technique may have some advantages over the mallet and chisel technique, which can produce a bad split.¹⁹

Possible Complications Of Tori Removal

Complications have rarely been reported with this type of surgery. When complications do occur,

they generally arise from the tearing of the thin, friable mucoperiosteal flap.²⁰ Care must be taken when using chisels and burs or a reciprocating saw in the floor of the mouth, as deep lacerations can not only be troublesome at the time of surgery, but can necessitate ligation of major vessels in the vicinity. Bleeding can lead to hematoma formation, edema of adjacent tissues, and possible airway compromise.

The mucoperiosteal flap must be reflected carefully, anteriorly and posteriorly, because of major anatomical structures in the underlying tissue. Anteriorly, the submandibular salivary duct, Wharton's duct, enters the floor of the mouth, and laceration of this duct may require surgical repair. Posteriorly, the lingual nerve passes underneath the mucosa adjacent to the alveolar ridge of the third and second molar tooth before it changes direction toward the

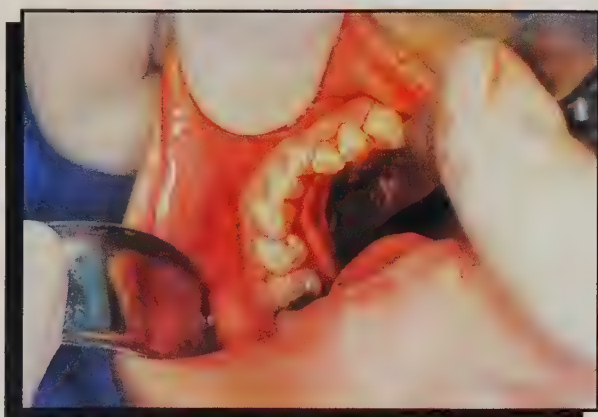


Fig. 6: Mucosa reapproximated.

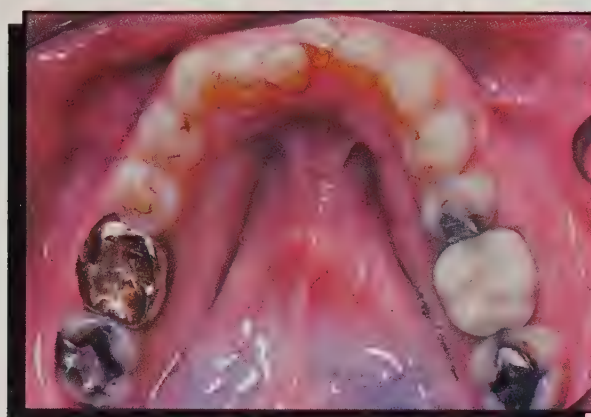


Fig. 7: Three-year follow-up appearance.

midline beneath the floor of the mouth. Laceration or trauma to the lingual nerve would result in paresthesia to the tongue, floor of mouth and lingual gingiva. The surgical repair of a lacerated lingual nerve is difficult and not always successful. Infection in this region could also have serious consequences, as it could spread through the adjacent tissue planes and spaces, creating an airway compromise. A thorough knowledge of the anatomical structures in the region and proper use of the instruments will prevent most complications.²¹

Summary

The purpose of this article was to refamiliarize the general practitioner with this commonly seen pathology, and increase the dentist's knowledge of the frequency of occurrence of this lesion, as well as the indications and techniques for its removal. ■

Dr. Pynn currently practices oral and maxillofacial surgery in Thunder Bay, Ontario. He has also been a senior resident in oral and maxillofacial surgery at Toronto Hospital.

Dr. Kurys-Kos is director of the dental internship program at Toronto Hospital.

Dr. Walker is an oral and maxillofacial surgeon on staff at Toronto Hospital.

Dr. Mayhall is a professor in the faculty of dentistry, University of Toronto.

Reprint requests to: Dr. D.A. Walker, Dental Department, ESG 450, Oral Surgery, The Toronto Hospital, 200 Elizabeth St., Toronto, ON M5G 2C4.

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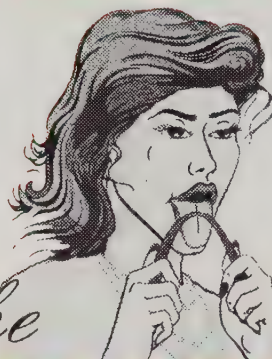
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CLINIQUE



Les malformations artérioveineuses, un diagnostic à la portée du dentiste

Jean-François Gravel, DMD, MRCD(C)

Françoise Follacci, DCD

Gilles Soulez, MD

Éric Therasse, MD

Introduction

Les régions de la tête et du cou abritent plus de 50 p. cent des lésions vasculaires, représentées par les télangiectasies et les angiomes. Ces lésions affectent principalement la peau et le cuir chevelu. Les maxillaires sont plus rarement atteints, avec une proportion deux fois plus importante à la mandibule qu'au maxillaire supérieur, le corps mandibulaire étant plus affecté que le ramus.^{2,5,6} On discerne deux catégories de lésions vasculaires : les hémangiomes vrais d'une part et les malformations vasculaires d'autre part, qui peuvent être capillaires, veineuses, lymphatiques, caveuses et artérioveineuses.⁷

Une malformation artérioveineuse (MAV) est une malformation vasculaire dans laquelle les artères communiquent avec les veines autrement que par le réseau capillaire normal. La communication se fait par un peloton vasculaire intermédiaire (nidus) correspondant à des shunts multiples. Cette entité est différente de la fistule artérioveineuse où la communication est le plus souvent directe.¹⁰

Les malformations sont le plus souvent congénitales, résultant d'un défaut de différenciation embryologique au moment de la formation du réseau capillaire. Dans ce cas, elles sont présentes dès la naissance, mais se manifestent sou-

vent plus tardivement au cours de la vie, à l'occasion d'un changement hormonal (puberté, grossesse notamment), d'un traumatisme ou de dérèglements vasomoteurs.

Les fistules sont le plus souvent acquises, généralement secondaires à un traumatisme, mais peuvent aussi apparaître lors de la rupture spontanée d'un anévrisme ou d'une artère.^{2,5}

Physiopathologie

À l'inverse des hémangiomes qui régressent chez 70 p. cent des patients avant l'âge de 7 ans, les MAV congénitales ne régressent pas. La plupart restent quiescentes plusieurs années, puis évoluent suite à un stimulus et deviennent symptomatiques.

Leur croissance est due non pas à une prolifération cellulaire, mais à un syndrome hémodynamique : au fur et à mesure que la malformation progresse, il y a stimulation réciproque entre l'accroissement du calibre des anastomoses et l'augmentation du flux sanguin dans la MAV, cercle vicieux qui aboutit à augmenter la taille de la MAV.^{2,7}

Symptômes cliniques et radiologiques

Il y a rarement atteinte de l'état général dans les cas de MAV congénitales en raison de l'évolution progressive de celles-ci. En revanche, on peut noter une augmentation du volume cardiaque et

de la pression sanguine dans les cas de fistules artérioveineuses acquises ou de MAV de très grande taille.⁶ Localement, les MAV peuvent présenter la totalité ou certaines des caractéristiques suivantes : gingivorragie, mobilité des dents adjacentes à la MAV, asymétrie faciale due à l'enflure ou à l'hypertrophie du maxillaire concerné, masse pulsatile sensible à la palpation, souffle intermittent à l'auscultation en regard de la lésion, dyschromie de la muqueuse ou de la peau adjacente due à la présence de naevi ou de dilations veineuses, augmentation de la température cutanée d'environ 1°C en regard de la malformation, épistaxis. On rapporte également quelques rares cas de coagulopathie de consommation (diminution du facteur VIII, thrombocytopénie).¹ Des taux élevés de fibrinolyse ont été également associés aux MAV.

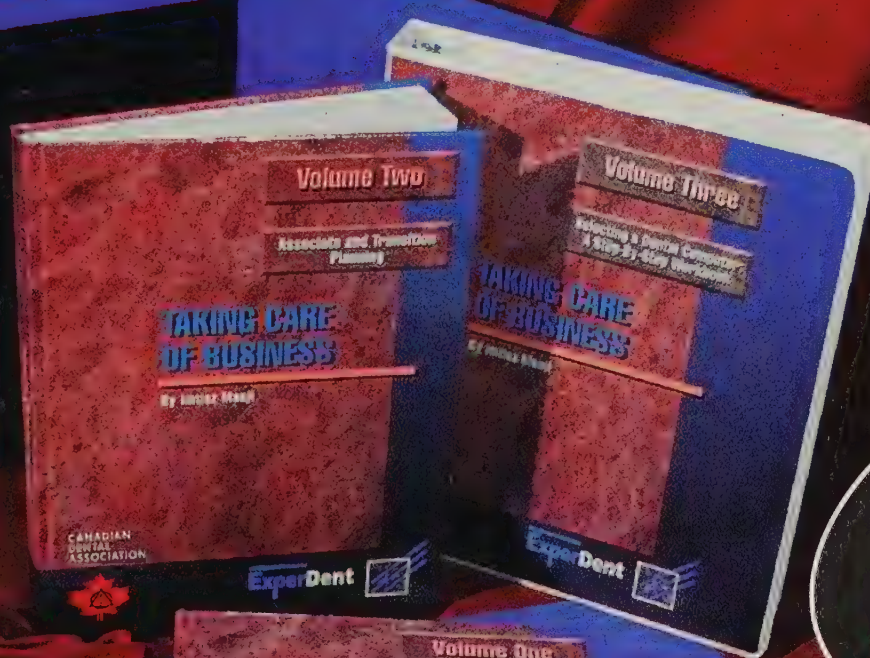
Le patient peut se plaindre de bruits pulsatiles dans l'oreille, d'acouphènes, de baisse d'audition, de troubles de la vision, de paresthésie et de douleurs dentaires chroniques.^{2,5,6}

Radiologiquement, il existe plusieurs formes d'atteinte osseuse d'aspect variable. On note principalement trois apparences caractéristiques :

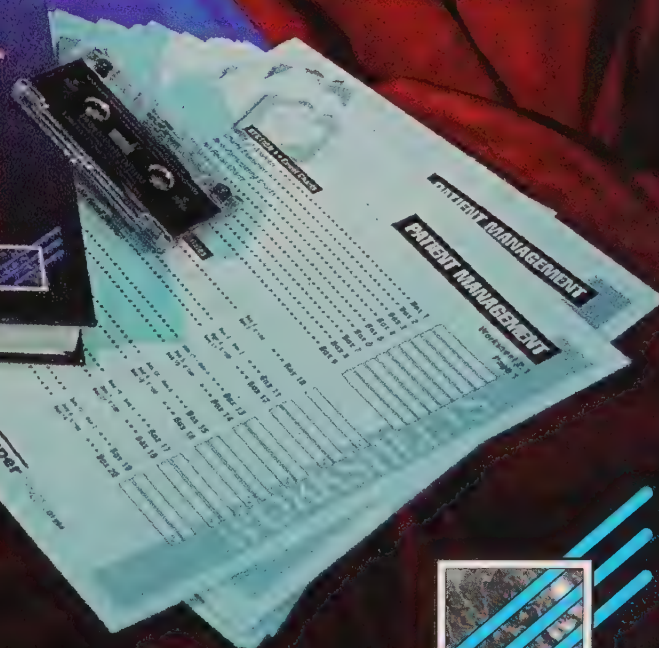
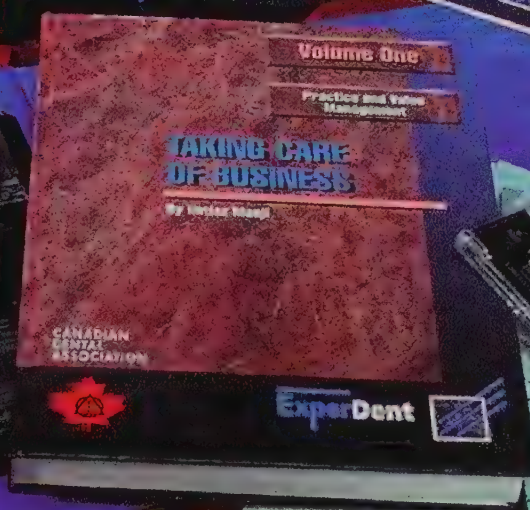
1. une apparence en rayons de soleil causée par de l'os trabéculaire entre les vaisseaux et la lésion ostéolytique;



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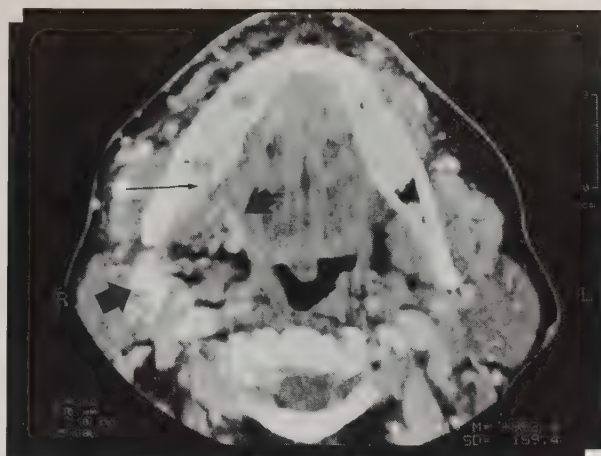


Fig. 1: Coupe tomographique avec infusion à l'étage du corps mandibulaire. Érosion de la mandibule (→). Opacification d'un réseau vasculaire normal (■).

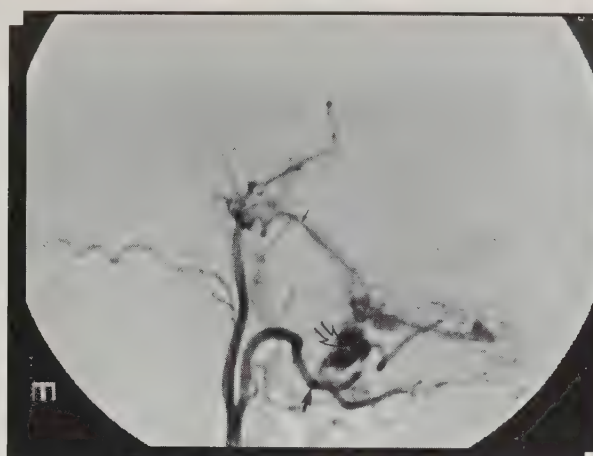


Fig. 2: Artériographie sélective de la carotide externe droite, phase artérielle. Opacification de multiples fistules artério-veineuses (⇨) naissant, - de l'artère faciale droite (⇨), - de l'artère alvéolaire inférieure droite (→).

2. un aspect en bulles de savon ou en nid d'abeille;
3. une zone radiolucide mal définie.

On peut également observer une expansion corticale, des résorptions radiculaires ou des absences de *lamina dura*.^{2,5} La présence de phlébolithes est typique d'une malformation veineuse.

Diagnostic

Les signes cliniques et radiologiques évoqués précédemment ne sont pas eux-mêmes pathognomoniques des MAV. Cependant, l'association de plusieurs de ces symptômes doit éveiller l'attention du dentiste et le conduire à des examens complémentaires. Le diagnostic sera donc dans ce cas confirmé par différents examens : l'échodoppler, la tomographie avec infusion et si nécessaire l'angiographie, qui permettront en outre de délimiter l'extension de la lésion et éventuellement de révéler l'existence d'une autre MAV asymptomatique.²

Ce diagnostic a une importance fondamentale avant tout traitement, car une biopsie ou une extraction dentaire dans le site d'une MAV peut provoquer une exacerbation importante de l'évolution de la MAV, voire même une hémorragie sévère pouvant conduire à la mort par exsanguination. Même la ligature des deux carotides externes peut ne pas suffire à contrô-

ler l'hémorragie, étant donné la circulation collatérale extensive associée à ces lésions.^{2,5}

Traitement

Si la MAV est quiescente (asymptomatique), l'observation demeure le premier choix.

Dans le cas contraire, plusieurs approches ont déjà été envisagées pour le traitement des MAV :

- la ligature des vaisseaux afférents à la MAV : celles-ci est à proscrire car elle stimule la formation de nombreuses collatérales avec un échec thérapeutique inévitable.
- l'injection de différents types d'agents sclérosants par voie percutanée a été essayée avec quelque succès.²

Plus récemment, les progrès des techniques angiographiques ont permis de réaliser, avec de meilleurs résultats, l'embolisation des lésions par voie endovasculaire.^{2,4} Celle-ci se fait de préférence avec des particules non résorbables (Ivalon), mais peut aussi être réalisée à l'aide d'agents sclérosants ou de colle tissulaire. Cependant, des risques de récurrence persistent avec cette technique.⁶

La résection chirurgicale des lésions est également une excellente méthode de traitement, mais la résection complète est parfois impossible et peut entraîner des problèmes esthétiques dans la région maxillo-faciale.^{1,9} La solution de choix apparaît donc l'embolisation

angiographique suivie d'une résection chirurgicale^{2,5} ou, lorsque la chirurgie est contre-indiquée, l'embolisation seule.^{1,3} Celle-ci sera supra-sélective, c'est-à-dire la plus distale possible en utilisant des microcathéters.¹

Présentation d'un cas

Un homme de 39 ans se présente à la clinique de chirurgie maxillo-faciale pour une douleur persistante dans la région pré-molaire-molaire inférieure droite. La douleur présente des paroxysmes, notamment lorsque le patient est stressé et s'étend à la région sous-mandibulaire droite.

En outre, il entend un souffle pulsatile dans l'oreille lorsqu'il est couché du côté droit.

Six mois plus tôt, il a suivi pour le même problème une antibiothérapie, puis a subi des traitements de canaux sur la deuxième prémolaire et la première molaire inférieures droites sans aucun résultat. Une sialographie a montré l'absence de pathologie salivaire.

Lorsque le patient se présente, l'examen intra-oral révèle une bonne santé dentaire, mais une coloration bleutée du plancher de la bouche ainsi que du vestibule allant de l'incisive centrale gauche à la première molaire inférieure droite.

À l'examen extra-oral, on note une « tache de naissance » sous forme d'un réseau bleuté au niveau de la région latérale droite du cou

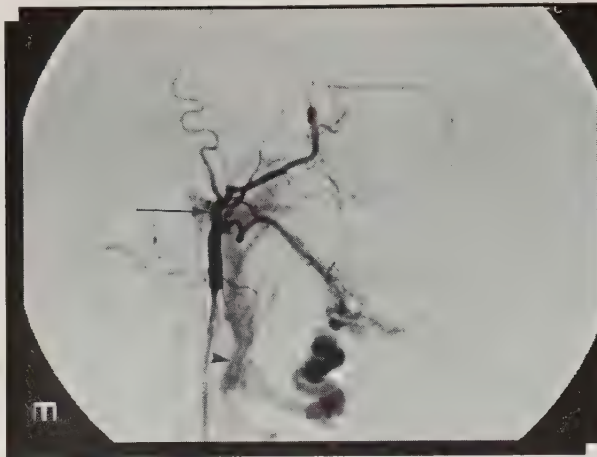


Fig. 3a: Opacification hypersélective de l'artère maxillaire interne droite (→). Importance participation de l'artère alvéolaire inférieure droite (→) à la fistule artério-veineuse. Opacification de la veine jugulaire externe droite (➤).

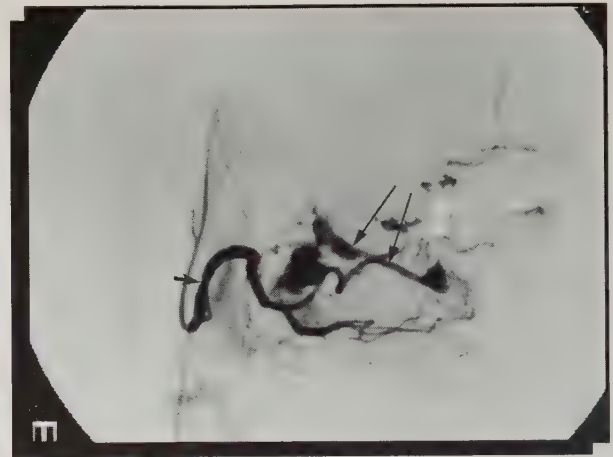


Fig 3b: Opacification de l'artère faciale droite (→). Participation des branches distales de l'artère faciale droite à la MAV au sein du canal dentaire (→).

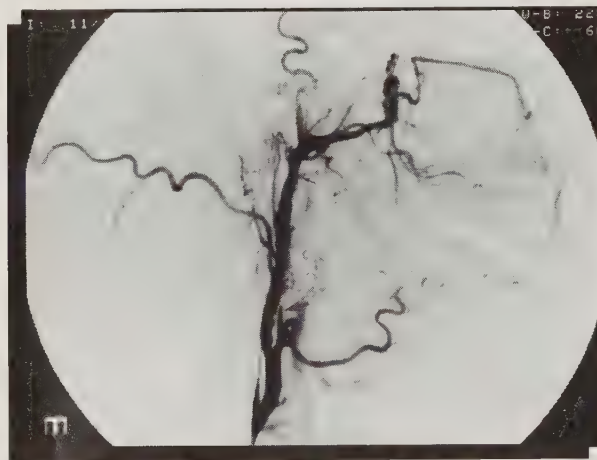


Fig. 4: Artériographie de la carotide externe droite post-embolisation. Occlusion complète de l'artère alvéolaire (→) et de l'artère faciale (→).



Fig. 5: Aspect de réseau bleuté du côté droit du cou s'étendant à la région sterno-vasculaire.

jusqu'au sternum. Le patient dit avoir été opéré deux fois à ce niveau d'un « kyste hypodermique ». La lèvre inférieure est également bleue. On note une douleur à la palpation sous-maxillaire et du corps mandibulaire droit. L'auscultation de la région maxillaire inférieure droite permet d'entendre un souffle rythmé sur le flux sanguin.

Une radiographie panoramique montre une petite calcification dans les tissus mous de 4,0 mm de diamètre antérieurement à l'angle mandibulaire droit, ainsi qu'une image mitée de la corticale de l'os basal dans la région de la troisième molaire droite.

Cet ensemble d'examen permet de suspecter l'existence d'une lésion vasculaire dans la région mandibulaire droite et l'investigation est poussée plus loin, d'autant plus qu'entre temps le patient a dé-

veloppé une paresthésie progressive de la lèvre. Un examen tomodensitométrique avec injection (**Fig. 1**) ainsi qu'une angiographie viennent confirmer le diagnostic de malformation artérioveineuse congénitale (**Fig. 2**). La présence d'un phlébolithe, associée à la coloration bleutée cutanée et muqueuse sont suggestives d'une malformation veineuse associée.

Différentes artériographies sont réalisées afin de déterminer les origines et l'extension de la lésion : il est établi que la malformation naît des rameaux à destinée du plancher buccal de l'artère faciale essentiellement (**Fig. 3b**) et accessoirement du rameau alvéolaire inférieur de l'artère maxillaire interne (**Fig. 3a**).

Après consultation multicentrique entre spécialistes (radiologues-interventionnistes et chirurgiens), il est décidé de traiter la

malformation par embolisation. Le protocole suivant est observé :

1. embolisation par Ivalon 300 à 600 et 600 à 1 000 de l'artère faciale droite, de l'artère alvéolaire inférieure droite et d'une petite branche pharyngée droite, donnant un résultat très satisfaisant, excepté la persistance d'une opacification minime de la fistule par des collatérales sous-orbitaires;
2. artériographie de la carotide externe gauche, montrant une nouvelle alimentation de la fistule par des collatérales de l'artère faciale gauche;
3. embolisation de l'artère faciale gauche après laquelle il y a absence d'opacification résiduelle via la carotide externe gauche.

Un résultat très satisfaisant est donc obtenu en post-opératoire (**Fig. 4**).

Le patient est revu un an plus tard : la douleur a totalement disparu ainsi que le bruit pulsatile dans l'oreille. L'auscultation est également négative. La tache bleue au niveau du cou n'a pas disparu complètement mais a un peu diminué (Fig. 5).

La coloration bleutée de la lèvre reste la même, mais au niveau du vestibule et du plancher elle s'est légèrement déplacée à gauche. On note en outre l'existence d'un point bleu induré dans la joue de la grosseur d'un pois qui pourrait être un phlébolithe.

La persistance de ces symptômes corrobore la présence d'une malformation veineuse associée. Le patient étant asymptomatique, celle-ci n'entraîne qu'un préjudice esthétique et la simple observation clinique est donc de mise.

Conclusion

Les MAV de la tête et du cou sont des lésions relativement peu fréquentes dont les symptômes cliniques ne se manifestent souvent que tardivement et avec plus ou moins d'intensité. Cependant, les conséquences peuvent être dramatiques en cas de chirurgie ou de traumatisme dans cette région, aboutissant éventuellement à la mort par exsanguination du patient. Il est donc essentiel d'établir un diagnostic précis avant d'entreprendre tout traitement si on a le moindre soupçon de lésion vasculaire ou qu'on ne peut établir de diagnostic dentaire satisfaisant, car une biopsie, une extraction ou tout autre chirurgie dans un tel site serait catastrophique. ■

Remerciements : Nous désirons remercier madame Louise Aubé, secrétaire du département de stomatologie, ainsi que le service d'audio-visuel de l'Hôpital Notre-Dame.

D^r Gravel est chirurgien buccal et maxillo-facial, département de stomatologie, Hôpital Notre-Dame à Montréal.

D^r Françoise Follacci est résidente, département de stomatologie, Hôpital Notre-Dame à Montréal.

D^r Gilles Soulez est radiologiste département de radiologie, section angioradiologie, Hôtel Dieu de Montréal.

D^r Éric Therasse est radiologiste département de radiologie, section angioradiologie, Hôtel Dieu de Montréal.

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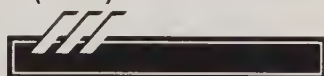
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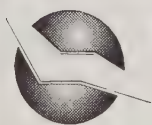
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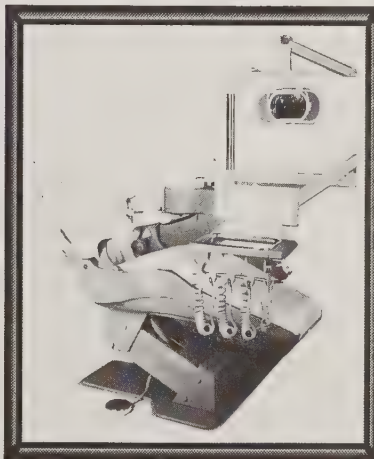
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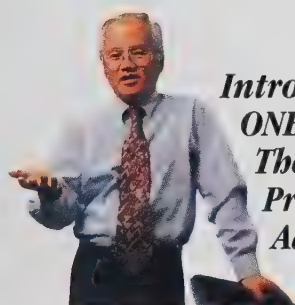
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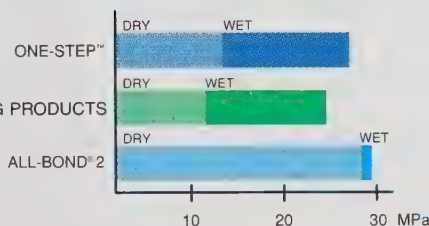
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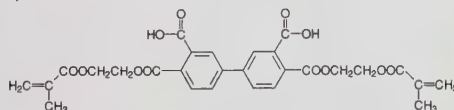
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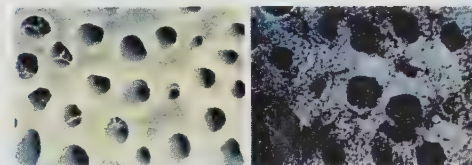


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* US Patent #5,348,988 † US Patent #5,385,728 ‡ moist does not mean saliva or blood contaminated
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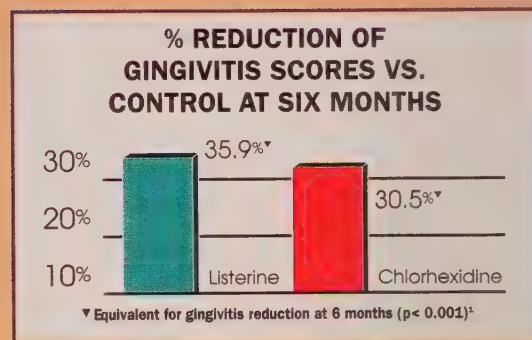
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